



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE**

**Faculty of Pharmaceutical Sciences
Ph.D
New Syllabus**



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

A GRADE AWARDED BY GOVT OF INDIA
A+ GRADE REACCREDITATION BY NAAC

**Faculty of Pharmaceutical Sciences
Doctor of Pharmacy
Ph.D**

PROGRAMME STRUCTURE & SYLLABUS

**w.e.f. 2022-23
Ph.D. 2022-23**



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

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Programme Structure and Syllabus

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Ph. D. 2022-23

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in **RESEARCH METHODOLOGY**

2 Credits (2*15hrs)

| S. No. | Topic | No. of Lectures |
|---------------|---|------------------------|
| 1 | Meaning of research, purpose of research, types of research (educational, clinical, experimental historical descriptive, basic applied and patent oriented research)-objectives of research. Literature survey: use of library, books and journals-medline-internet, getting patients and reprints of articles as source for literature survey. Selecting a problem and preparing research proposal for different types of research mentioned above. Study design, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques. | 08 |
| 2 | Methods and tools used in research. Qualitative studies, quantitative studies. Sample data organization, descriptive data analysis. Limitation and source of error. Technical report writing/ paper writing/ thesis writing. Plagiarism. | 06 |
| 3 | Guidelines and techniques for experiments with animals. CPCSEA, BS, and OECD guidelines, Acute Toxicity studies, bioassays, handling of biological waste. Bio-screening of antihypertensives, antipsychotics, analgesics, anti-inflammatory drugs. Alternatives to animal experimentation; Preclinical models using zebrafish and Drosophila melanogaster. | 08 |
| 4 | Biostatistics: Standard deviation, probability distribution, binomial polynomial distribution, continuous data distribution, linear regression and correlation, significance of correlation and regression, parametric tests (students “t” test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), testing hypothesis, types of error, test of significance for | 08 |

| | | |
|-------------------|--|--|
| | correlation coefficient. | |
| | | |
| REFERENCES | | |
| 1 | C.R. Kothari, 2004. "Research Methodology". 2 nd Ed. New Age International (p) Limited, Publishers. | |
| 2 | J.R. Fraenkel, N.E. Wallen, 2008. "How to Design and Evaluate Research in Education", 7 th Ed. Boston: McGraw-Hill. | |
| 3 | G. Bordage, B. Dawson, 2003. Experimental study design and grant writing in eight steps and 28 questions. <i>Medical Education</i> , 37(4): 376-385. | |
| 4 | D. Montgomery, 2000. "Design of Experiments". 5 th Ed. Wiley Interscience | |
| 5 | K.P. Willkinson, L. Bhandarkar, "Formulation of Hypothesis". 3 rd Ed. Himalaya publishing, Mumbai. | |
| 6 | Cochran & Cocks, 1957. 2 nd Ed. "Experimental Design" New York, John Willy & sons | |
| 7 | J.W. Best and J.V. Kahn, 2006. "Research in Education". 10 th Ed. PHI publication | |
| 8 | C. B. Gupta, Introduction to Statistical Methods | |
| 9 | LD Fisher, GV Belle, Biostatistics: A Methodology for Health Sciences. 2 nd Edition. Wiley Interscience .2004 | |
| 10 | Sanford Bolton. Pharmaceutical statistics- Practical and clinical applications. 4 th edition, publisher Marcel Dekker Inc. New York. | |
| 11 | Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London | |
| 12 | Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York | |
| 13 | Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990 | |

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through assignments, quizzes, group discussion and presentation

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|--|--------------------|
| Syllabus in detail (Theory) | 4 hours |
| <p>RPE 01: Philosophy and Ethics:</p> <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| <p>RPE 02: Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| <p>RPE 03: Publication Ethics:</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement and enforcement of Copyright and Patents | 7 hours |

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| Practical | |
| RPE 04: Open Access Publishing: <ol style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | 4 hours |
| RPE 05: Publication Misconduct: <ol style="list-style-type: none"> a) Group Discussions (2 hrs.) <ol style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review process b) Software Tools (2 hrs.) <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| RPE 06: Database and Research Metrics: <ol style="list-style-type: none"> A. Databases (4 hrs.) <ol style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3 hrs.) <ol style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h – index, g index, i 10 index, altmetrics. | 7 hours |

References:

Bird,A. (2006) Philosophy of Science. Routledge.

MacIntyre, Alasdair (1967) A Short History of Ethics. London.

P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865

National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.

Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from

<https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>

Beall,J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. <https://doi.org/10.1038/489179a>

Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.

https://www.insaindia.res.in/pdf/Ethics_Book.pdf

Ph.D. Coursework Syllabus w.e.f. 2017

Suggested Readings;

1. Resnik, Shamoo: Responsible conduct of Research: Oxford University Press
2. Comstock: Research ethics: Cambridge university Press
3. Robin: Research ethics: Indiana University press
4. Tony Mayer: Promoting Research Integrity in a Global Environment: World Scientific Publishing
5. Paul Oliver: The Student's Guide to Research Ethics: Open University Press
6. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance: Indian National Science Academy
7. David V Thiel: Research methods for Engineers: Cambridge Press

Note: Latest references with relevant research papers and articles from reputed journals will be added by the teaching faculty during the class

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Course Work Syllabus 2022

Advanced Level Course in Pharmaceutics

2 Credits (2*15hrs)

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| 1 | a. ICH guidelines for stability evaluation. b. Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments and Validation of specific dosage form. c. Regulatory parameters related to the formulations and devices. | (3hrs) |
| 2 | QbD based formulation development and Statistical Designs for optimization. | (2hrs) |
| 3 | Colloidal DDS: Specialized DDS like micro / nano emulsions, SMEDDS, Multiple emulsions, liposomes, niosomes, polymeric micelles and other vesicular DDS: Design, development, issues and consideration. | (3hrs) |
| 4 | Nanoparticulate systems such as lipid nanoparticles and polymeric nanoparticles: Methods of preparation, characterization and applications. | (4 hr) |
| 5 | Parenteral DDS: Development and evaluation of CR Injectables and implants. | (2 hr) |
| 6 | Peptide and protein based DDS: Chemistry and special features of peptide and protein molecules, stability, analysis, Formulation and evaluation Barriers to peptide and protein delivery; Routes of delivery, Toxicity, immunogenicity, vaccines and gene based DDS. | (4 hr) |
| 7 | Pulmonary DDS – Physiological basis and formulation considerations. Design of Pressurized aerosols, Dry powder DDS, Devices for administration and evaluation. | (3hr) |
| 8 | Targeted DDS: Concept of drug targeting, need for drug targeting , basis for drug targeting both active and passive. Ligands for targeted delivery, Monoclonal antibodies in targeted delivery, design of targeted DDS for cancer and infectious diseases, Brain and Colon targeting approaches and | (3hr) |

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| | DDS | |
| 9 | In vitro / ex vivo models for evaluation of Drug absorption. | (2Hr) |
| 10 | Toxicity testing: In vitro toxicity testing and its application to safety evaluation. Validation of In vitro toxicity tests. Acute, sub acute and chronic toxicity testing. | (2hr) |
| | | |
| | References | |
| 1. | Martin, P.Bustamante and A.H. Chun; Physical Pharmacy; Waverly | |
| 2. | M.N. Rubinstein, Pharmaceutical Technology, Drug Stability, John Wiley and Sons | |
| 3. | P.H.List and P.C. Schmidt; Pharmaceutical technology, CRS press. | |
| 4. | Robinson, Novel Drug Delivery System, Marcel Dekker. | |
| 5. | Morton Rosoff, Controlled release of drugs, VCH Publishers | |
| 6. | N.K. Jain, Controlled and Novel Drug delivery, CBS Publisher, New Delhi. | |
| 7. | P. Johnson and J.G. Lloyd – Jones, Drug Delivery Systems, VCH Publisher | |
| 8. | Bolton S; Pharmaceutical statistics; Marcel Dekker | |
| 9. | Hand book on GLP, Quality practices for regulated non-clinical research and development (http://www.who.int/tdr/publications/documents/glphandbook.pdf). | |
| 10. | Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, Ministry of Health and Family Welfare (department of health) NewDelhi | |
| 11. | Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London | |

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Syllabus for Course Work

Advanced Level Course in Pharmaceutical Chemistry

2 Credits (2*15hrs)

| | | |
|-----------|---|-----------------|
| 1 | Advanced Analytical Techniques: | 5 hours |
| | Applications of IR, NMR, Mass Spectrometry, HPLC, HPTLC, GC-MS, LC-MS and LC-MS-MS. | |
| 2. | Protection-deprotection of functional groups: | 3 hours |
| | Aldehydes, ketones, hydroxyl, carboxyl and amino groups. | |
| 3. | Reactions involving organopalladium catalysts and their ligands | (3 hrs) |
| | Wacker Reaction and related oxidations, Heck Reaction and others | |
| 4. | Concerted Cycloadditions | 5 hours |
| | Diels-Alder Reactions, Dipolar Cycloaddition, Sigmatropic Rearrangements | |
| 5. | Drug discovery and QSAR : | 7 hours |
| | Drug Discovery Strategies Direct Drug Design (Structure based) and Indirect drug design, Target selection and lead Identification. a) Physicochemical parameters in QSAR and applications of Models i) Hansch ii) Free Wilson iii) Mixed models | |
| | b) Development of 3D QSAR and Pharmacophore models and their applications | |
| 6. | Molecular Modelling in Drug Design: | 7 hours |
| | Introduction to Molecular Modelling: Concepts and Methods, Molecular Mechanics - force fields (Potential energy function), Energy Minimization Methods - Steepest descent, Conjugate gradients, Newton methods (Non mathematical), Conformational Analysis, Systematic search, Monte carlo simulations, Molecular dynamics simulations. Types molecular docking simulation methods and scoring. | |
| | RECOMMENDED BOOKS: | |

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| 1 | Silverstein, Basseler, Morrill - Spectrometric identification of organic compounds (John Wiley and Sons, N.Y.) | |
| 2 | J.R.Dyer - applications of Absorption Spectroscopy of Organic compounds (Prentice Hall, London) | |
| 3 | C.N.R.Rao - Chemical applications of Infra-red spectroscopy (Academic press, N.Y.) | |
| 4 | R.J. Hamilton-Introduction to High Performance Liquid chromatography, (Chapman and Hall, London) | |
| 5 | Burger : Medicinal Chemistry (John Wiley & Sons N.Y.) | |
| 6 | Foye : Principles of Medicinal Chemistry (Varghese & Co.) | |
| 7 | Ledwith : Organic Drug synthesis Vol. 1, 2, 3, 4 (John Wiley & Sons N.Y.) | |
| 8 | Ariens : Medicinal Chemistry Series | |
| 9 | Ellis and West : Progress in Medicinal Chemistry Series | |
| 10 | Butterworth: Progress in Medicinal Chemistry Series | |
| 11 | Wilson and Gisvold - Text book of Medicinal Chemistry (J.B. Lippincott) | |
| 12 | Comprehensive Medicinal Chemistry - Series -I-VI (Elsevier Pergamon) by Corwin Hansch, Peter G.Sammes and John B. Taylor. | |
| 13 | Contemporary Drug synthesis (Wiley Interscience) by Jie-Jac Li, Douglas S. Johnson, Drago R. Silskoric and Bruce D. Roth. | |
| 14 | The Practice of Medicinal Chemistry (Academic Press, Elsevier), 2 nd Edition by Camille G. Wermuth | |
| 15 | Synthesis of Drug, A synthon approach by Radhakrishnan P. Iyer & Anant V. Prabhu, 1 st Edition, (1985) Sevak Publications, Mumbai | |
| 16 | Hugo Kubing - QSAR, Hansch Analysis and Related approaches Vol.1 | |
| 17 | Advanced Organic Chemistry Part B: Reactions and Synthesis FRANCIS A. CAREY and RICHARD J. SUNDBERG | |

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Syllabus for Course Work

Advanced Level Course in Pharmacology

2 Credits (2*15hrs)

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| 1. | Care, handling and breeding techniques of laboratory animals. | (2 hrs) |
| | CPCSEA guidelines OECD guidelines, Preparation of Form B | |
| 2. | Preclinical Screening of drugs using recent evaluation techniques | (5 hrs) |
| | Transgenic animals: Production, maintenance and applications, Microdialysis, highthroughput screening, radioligand binding assay, patch clamp technique, Immunohistochemistry, Immunoassays | |
| 3. | Molecular mechanism of drug action | (5 hrs) |
| | Receptor occupancy and cellular signalling systems such as G-proteins, cyclic nucleotides, calcium and phosphatidyl inositol. Ionic channels and their modulators. Secondary messengers. | |
| 4. | Screening of Drugs used in treatment of | (5 hrs) |
| | Drugs for neurodegenerative diseases, Reproductive Pharmacology: Aphrodisiacs and antifertility agents, Anti cancer agents Immunomodulators, Immunosuppressants and immunostimulants | |
| 5. | Regulatory Studies on | (5 hrs) |
| | Toxicity Studies Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies Extrapolation of <i>in vitro</i> data to preclinical and preclinical to humans Toxicokinetics- Toxicokinetic evaluation in preclinical studies, saturation kinetics Importance and applications of toxicokinetic studies. Alternative methods to animal toxicity testing. | |

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| 6. | Principles and applications of genomic and proteomic tools | (3 hrs) |
| | DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting Genetic variation and its role in health/ pharmacology | |
| 7. | Concept of clinical research | (1 hr) |
| | Ethics, organization and phases of clinical trials | |
| 8. | Safety pharmacology studies | (4 hrs) |
| | Origin, concepts and importance of safety pharmacology. Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies. | |
| References: | | |
| 1. | Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990 | |
| 2. | Goodman and Gilman's; The pharmacological basis of therapeutics Ed. Brunton L., Chamber B., Knollman B., 12th edition, McGraw Hill, New York, 2011. | |
| 3. | Katzung B. G., Masters S. B. and Trevor A. J.; Basic and Clinical pharmacology, 11th edition, Lange Tata McGraw Hill edition, 2009. | |
| 4. | Hand book on GLP, Quality practices for regulated non-clinical research and development (http://www.who.int/tdr/publications/documents/glphandbook.pdf). | |
| 5. | Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, Ministry of Health and Family Welfare (department of health) New Delhi | |
| 6. | Rang and Dale's Pharmacology, Churchill Livingstone, 6th edition, 2007. | |
| 7. | Sheth U. K., Dadkar N. K. and Kamat U. G.; Selected topics in experimental pharmacology, Kothari Book Depot, Mumbai. | |

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| 8. | Lawrence D. R. and Bacharch A. L.; Evaluation of Drug Activities, Pharmacometrics, Academic Press. |
| 9. | Kulkarni S. K.; Handbook of experimental pharmacology, Vallabh Prakashan, New Delhi. |
| 10. | Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London |
| 11. | Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York. |
| 12. | Oxford Textbook of Medicine, 3rd edition, Vol. I, II, III. Ed. Weatherall D. J. Ledingham G. G., Warrell D.A., Oxford medical publications, 1996 |
| 13. | Walker R., Edward C.; Clinical pharmacy and therapeutics, 3rd edition, Churchill, Livingstone, London, 2003 |
| 14. | Laurence D. R., Benett P. N.; Clinical Pharmacology, 6th edition, Churchill, Livingstone, 1987. |
| 15. | Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London |
| 16. | Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York. |
| 17. | Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990 |

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Advanced Level Course in PHARMACOGNOSY

| S. No. | Topic | No. of Lectures |
|---------------|--|------------------------|
| 1 | Phytochemical screening of crude drugs: Extraction, isolation, purification, characterization of following phytoconstituents. Alkaloids: Caffeine, Atropine, Ergometrine Glycosides: Digoxin, Sennosides Flavonoids: Rutin, Quercetin Terpenoids: Clove oil Saponins: Glycyrrhizitinic acid, Diosgenin | 04 |
| 2 | Plant Extracts, Preparation and standardization of Phyto-pharmaceuticals <i>Withania somnifera, Tinospora cardifolia, Curcuma longa, Ocimum sanctum, Tribulus terrestris, Adhatoda vasica, Emblica officinalis, Centella asiatica, Azadirachta indica.</i> | 04 |
| 3 | Quality control of herbal drugs as per WHO guidelines | 04 |
| 4 | Application of various Chromatographic and Spectrometric techniques like TLC, CC, GLC, HPLC, HPTLC, UV, IR, NMR, MS, Flash Chromatography etc. for standardization of plant drugs. | 04 |
| 5 | Plant Tissue Culture Introduction, Techniques of initiation and maintenance of various types of cultures, Static, Suspension and hairy root cultures, Immobilization of plant cells, Biotransformation, Bioreactors for production of phyto-constituents and strategies for enhanced production of phyto-constituents. | 04 |
| 6 | Traditional systems of medicines and drug formulations of Ayurveda, Siddha, Unani, Homeopathy, TCM (Traditional Chinese Medicine) | 03 |
| 7 | Herbal Drug Regulations affairs | 03 |
| 8 | Herbal cosmetics and Herbal drug formulations Ingredients used in various products such as creams, powders, lotions, hair products, nail polishes, lipsticks and toiletries etc. and their analysis. | 04 |

REFERENCES

1. Mukherjee Pulok, Quality Control of Herbal Drugs, Business Horizons Limited, New Delhi.
2. Advances in Natural Product Chemistry, extraction and isolation of biologically active compounds. S. Natori et al., Wiley, New York.
3. Phytochemical Methods by J.B. Harborne, Chapman and Hall, International Ed., London.
4. Modern methods of plant analysis by Peach and Tracey, Vol. II, IV, Springer Verlag.
5. G.E. Trease and W.C. Evans., Pharmacognosy, W.B. Saunders Co. Ltd., Harcourt Publishers Ltd. UK.
6. Quality Control Methods for medicinal plant material, WHO Geneva.
7. Wagner H, Bladt S, 1996. Plant Drug Analysis- A Thin Layer Chromatography Atlas, 2nd Ed., Springer-Verlag, Berlin.
8. Stahl Egon, Thin layer chromatography, 2nd Edition, Springer Publication.
9. Mukherjee PK, 2003. GMP for Indian system of medicine. In GMP for Botanicals. Verpoorte R, Mukherjee PK (Edn.), Business Horizons Limited, New Delhi.
10. Ajay G Namdeo, Medicinal Plant Biotechnology, Career Publications Nasik.
11. Herbal Drug technology by SS Agrawal and M Paridhavi, Orient Longman
12. Indian Herbal Pharmacopoeia, Vol. I- II, SS Handa, RRL Jammu Tawi, and IDMA Mumbai.
13. The Aurvedic Pharmacopoeia of India, 1999. Government of India, Ministry of Health and Family Welfare, Department of Indian Systems of Medicine and Homeopathy, New Delhi.
14. Standardization of Botanicals by V. Rajpal, Vol. I and Vol II, Eastern Publishers, New Delhi.
15. Houghton P, Mukherjee PK. Evaluation of Herbal Medicinal Product, Pharmaceutical Press, London, 2009.
16. Neutraceuticals by Lisa Rapport and Brain Lockwood.
17. Pharmacognosy by CK Kokate, APPurohit and SB Gokhale, Nirali Prakashan, Pune
18. Pharmacognosy by VD Rangari, Career Publications, Nasik
19. Quality Standards of Indian Medicinal Plants Vol. I- V, Indian Council of Medical Research, New Delhi.
20. Marine Pharmacognosy by DF Martin and GM Padilla, Academic Press.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Ph.D. Course Work

Advanced Level Course in Pharmaceutical Biotechnology 2017

1. Understanding Molecular and genetic mechanisms, Genes and Chromosomes (5Hrs)

Chromosomal organization and morphology in eukaryotes and prokaryotes-exons and introns, mobile and organelle DNAs, nucleosome-structure and spatial organization-histones-transposons Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; Cohesive and blunt end ligation; Linkers; Adaptors; Labeling of DNA: Hybridization techniques: Northern, Southern and Colony hybridization, Fluorescence in situ hybridization; DNA-Protein Interactions-Electromobility shift assay.

2. Genetic Engineering (5Hrs)

Cloning Vectors: Plasmids; Bacteriophages; M13 vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/baculo & retroviral vectors; Expression vectors; pMal; GST; pET-can be omitted vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; Methodologies to reduce formation of inclusion bodies; Baculovirus and pichia vectors system. Expression cloning; Yeast two hybrid system; Phage display; PCR: Primer design; Taq DNA polymerases; Proof reading enzymes; Types of PCR – multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products; PCR in molecular diagnostics.

3. Applications of Genetic Engineering (5Hrs)

Site specific mutagenesis; production of recombinant insulin, rDNA technology for the production of therapeutic proteins, Blood products: Erythropoietin, human serum albumin, Recombinant vaccine: Hepatitis B surface antigen, Regulatory proteins: growth hormones, interferon, Stability of rDNA products.

4. Enzyme technology and Bioprocess Engineering: (5Hrs)

Enzyme sources, techniques in extraction and purification, Enzyme stability and Kinetics, effects of pH, temperature, ionic concentrations on enzyme activity. Applications and immobilization techniques, Kinetics of cell/microbial growth, substrate utilization and product formation; Simple structured models; Sterilization of air and media; Batch, fed-batch and continuous processes; Aeration and agitation; Mass transfer in bioreactors; Rheology of fermentation fluids; Scale-up concepts; Design of fermentation media; Various types of microbial and enzyme reactors; Instrumentation in bioreactors.

5. Omics, Pharmacogenomics, and bioinformatics. (5Hrs)

Introduction, Biological macromolecules databases and search tools: computational tools and databases, Database mining tools, Computational tools for DNA sequence analysis, Genome analysis, Functional genomics and Proteome analysis.

Overview and advances in Pharmacogenomics, Pharmacogenetics and Proteomics. Molecular markers, sequencing, Next gene sequencing, microarray technology etc. Role of pharmacogenetics and pharmacogenomics in Drug metabolism and in optimizing individualized drug therapy.

6. Advanced tools in biotechnology (5Hrs)

Animal tissue culture, their pharmaceutical applications, Monoclonal antibody production and protoplast fusion. A detailed study on the theory, instrumentation and applications of following techniques *viz.*, PCR, Blotting techniques, Real-time PCR, Flow Cytometry, ELISA, RNAi mediated gene silencing, CRISPER-CAS technique for genome editing, mRNA and DNA vaccines. NGS platforms for DNA sequencing

References:

1. Elements of Biotechnology by P.K. Gupta.
2. Pharmaceutical Biotechnology, Vyas, CBS, Delhi.
3. J. Kubey, Immunology – an Introduction, 2004.
4. E. Benjamini, Molecular Immunology, 2002.
5. Arthur M. Lesk, Introduction to Bioinformatics (2002), Oxford University Press.
6. Text Book of Biotechnology by R.C. Dubey.

7. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
8. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi
9. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Quality Assurance Techniques

2 Credits (2*15hrs)

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| 1) | <p>i) ICH Guidelines: Introduction and detailed study of Q7, Q8, Q9, Q10, Q11, Q12 ICH guidelines.</p> <p>ii) Quality by Design: Basic principles and applications of QbD in pharmaceutical formulation development.</p> <p>iii) Current Good Laboratory Practices</p> | (6 hr) |
| 2) | <p>Pharmaceutical Validation:</p> <p>i) Introduction and Concepts: Prospective validation, retrospective validation, concurrent and revalidation; Validation master plan and Calibration master plan.</p> <p>ii) Qualification of Equipments with Examples:</p> <p>iii) Utilities Validation: Validation of pharmaceutical water system & pure steam; Validation of HVAC system.</p> <p>iv) Cleaning Validation: Cleaning of equipment; Cleaning of facilities</p> <p>v) Analytical Method Validation: General principles of analytical method validation;</p> <p>vi) Process Validation</p> | (6 hr) |
| 3) | <p>Quality Planning and Analysis: Basic concepts of quality; Quality control; Quality assurance; Total quality management; Quality in manufacturing; Materials management; Documentation and records; Six System Inspection model; Statistical Process control.</p> | (5 hr) |
| 4) | <p>Spectroscopic Methods: Theory, principle and instrumentation; Interpretation of data / structure elucidation and pharmaceutical applications of UV, IR, with examples.</p> | (4 hr) |
| 5) | <p>Separation Techniques: Theory, principle, instrumentation and</p> | (5 hr) |

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| | pharmaceutical applications of GLC, HPLC, HPTLC. | |
| 6) | Pharmaceutical Quality Audits: Plant level department wise documentation and quaternaries; Principle of quality audit; Preparing for FDA inspection of manufacturing site. | (4 hr) |
| | References: | |
| 1 | Good Manufacturing Practices by S.H.Wills and J.R.Stoker, Marcker and Dekker incorporations. | |
| 2 | Good Manufacturing Practices for Pharmaceuticals (6 th Edn.) by Joseph D. Nally, Informa Healthcare Publication. | |
| 3 | Selected International GMP guidelines of various countries like UK, USA, Australia, South Africa.WHO.India. & ICH guide lines. | |
| 4 | Pharmaceutical process validation by Robert Nash and A.H Wacther, Marcel and Dekker Inc. Vol. 129 | |
| 5 | Validation of pharmaceutical process (sterile products) by F.J Carleton and J.P Agalloco Marcel and Dekker Inc. | |
| 6 | Quality planning and analysis. By J. M. Juran and F.M. Gryna Tata Mcgraw Hill India. 5th Edition | |
| 7 | Juran's quality handbook; Juran J.M. and Godfrey A.B. McGraw Hill. | |
| 8 | Pharmaceutical Quality Assurance by M.A.Potdar Nirali Prakashan, Pune. | |
| 9 | Skoog : Principles of Instrumental Analysis (Saunders College Publishing Philadelphia) | |
| 10 | Willard, Merritt, Dean - Instrumental Methods of Analysis (CBS Publishers and Distributors, Delhi). | |
| 11 | Higuchi : Instrumental Methods of Analysis | |
| 12 | R.J. Hamilton-Introduction to High Performance Liquid chromatography, (Chapman and Hall,London). | |
| 13 | ICH Guidelines- Q7, Q8, Q9, Q10, Q11, Q12 | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Pharmacy Practice

2 Credits (2*15 h)

| | | |
|------------|---|---------------|
| I | CLINICAL PHARMACY | (10 h) |
| 1 | <ul style="list-style-type: none">• Clinical Pharmacy Services: Patient medication history interview, Concept of drug and poison information services, medication errors and its management• Lab Data Interpretation: Tests associated with cardiac disorders, pulmonary function tests, thyroid function tests, fluid and electrolyte balance, microbiological culture sensitivity and analysis | (7 h) |
| 2 | Critical evaluation and analysis: Biomedical literature, patient's data | (2 h) |
| 3 | Pharmacovigilance: Scope, aims and methods of Pharmacovigilance | (1h) |
| II | PHARMACOTHERAPEUTICS | (10 h) |
| 1 | Etiopathogenesis and pharmacotherapy of diseases/disorder associated with following systems: <ul style="list-style-type: none">• Neurological: Epilepsy, stroke, parkinsonism, Alzheimer's disease• Infectious: Meningitis, HIV and opportunistic infections, fungal infections, viral infections, sepsis and septicemia• Gastrointestinal: Peptic ulcer diseases, gastroesophageal reflux disease, inflammatory bowel diseases, liver diseases• Endocrine: Type 2 diabetes mellitus, thyroid disorders, oral contraceptives• Hematological: Anemia, venous thromboembolism, pulmonary embolism, drug induced blood dyscrasias• Musculoskeletal: Osteoarthritis, rheumatoid arthritis, gout, systemic lupus erythematosus• Pain management including Pain pathways, neuralgias, headaches | (8 h) |
| 2 | <ul style="list-style-type: none">• Evidenced based medicines: Concept and applications• General prescribing guidelines: Pregnancy and breast-feeding | (2 h) |
| III | HOSPITAL PHARMACY | (5 h) |

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| 1 | Hospital pharmacy services: Procurement & warehousing of drugs and pharmaceuticals, Inventory control Definition, various methods of Inventory control ABC, VED, EOQ, lead time | (2 h) |
| 2 | Drug distribution in the hospital <ul style="list-style-type: none"> ○ Individual prescription method ○ Floor stock method ○ Unit dose drug distribution method ○ Distribution of Narcotic and other controlled substances | (2 h) |
| 3 | Total parenteral nutrition (TPN) | (1 h) |
| IV | CLINICAL RESEARCH | (3 h) |
| 1 | Clinical Trials – Types, different phases, subject enrolment, safety monitoring, informed consent process | (1 h) |
| 2 | ICH, GCP personnel and function, central drug standard control organization (CDSCO) guidelines Composition, responsibilities, procedures of IRB / IEC | (1 h) |
| 3 | Overview of regulatory environment in USA, Europe and India | (1 h) |
| V | PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS | (2 h) |
| 1 | Pharmacoepidemiology: Scope and applications, methodological studies (in brief), concept of risk | (1 h) |
| 2 | Measurement of outcomes in Pharmacoepidemiology: Outcome measures, drug use measures, prevalence, incidence, incidence rate, and medication adherence measurement | (1 h) |

References:

1. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
4. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
5. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi et al.
6. Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
7. Williams and Wilkins Publication. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication
8. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
9. Pathologic basis of disease - Robins SL, W.B.Saunders publication
10. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
11. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
12. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
13. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
14. Hospital pharmacy by William .E. Hassan
15. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh
16. Textbook of Clinical Trials David Machin, Simon Day, Sylvan Green.Wiley Publications.
17. Textbook of Epidemiology – Brian Storm and Stephen E.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work 2022

Advanced Level Course in Drug Regulatory Affairs

2 Credits (2*15hrs)

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| 1) | ICH Guidelines , overview of QSEM classification and related guidance. Preparation of CTD Document. | (5 hr) |
| 2) | Drug registration process & types – USFDA, MHRA & India | (5 hr) |
| 3) | Bioequivalence guidelines for in-vitro, in-vivo & clinical trials in US, Europe & India. | (4 hr) |
| 4) | Documentation, Audits & Inspections: Master formula record (MFR), Master formula card (MFC), Batch processing record (BPR), Packaging records, Standard operating procedure (SOP), Site master file, specifications, Certificate of analysis (COA), Material safety data sheet (MSDS), Method of Analysis (MOA), Annual product review, validation protocols, Stability protocol, T-License, forms, maintenance of records in Pharmaceutical industry. | (4 hr) |
| 5) | Clinical trial regulations: India, USA & Europe | (3hr) |
| 6) | Medical device regulations: India, USA & Europe | (3 hr) |
| 7) | Biologics regulations: India, USA & Europe | (3 hr) |
| 8) | Herbal drug regulations: India, USA & Europe | (3 hr) |
| References: | | |
| 1 | Common Technical documents (ICH guidelines). | |
| 2 | WHO GMP guidelines | |
| 3 | Establishing a cGMP Laboratory Audit System, A practical Guide by David M.Bleisner, Wiley Publication. | |
| 4 | How to practice GLP by PP Sharma, Vandana Publications | |

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| 5 | www.mhra.gov.uk | |
| 6 | www.who.int | |
| 7 | www.ich.org | |
| 8 | https://cdsco.gov.in | |
| 9 | www.fda.gov | |
| 10 | www.emea.europa.eu | |
| 11 | FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, Douglas J. Pisano , David S. Mantus ; Informa ,2008 | |



Bharati Vidyapeeth
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Poona College of Pharmacy
Erandwane, Pune - 411 038
Website: <https://www.bvuniversity.edu.in/pcp>
Email: pcp@bharatividyaapeeth.edu

Bharati Vidyapeeth
(Deemed to be University)
College of Architecture, Pune
Doctoral Programme- 2022

Syllabus for Ph. D. Entrance Exam

ARCHITECTURE

NOTE:

The syllabus is based on 5 year B.Arch architecture course prescribed by COA 2017 guidelines. Five questions of 10 Marks each will be asked on the overall syllabus

Section – II

| Unit No. | Syllabus |
|----------|--|
| 1 | <p>BUILDING MATERIALS AND CONSTRUCTION</p> <p>Properties and behavior of both natural and man-made building materials such as bricks, stones, metals, timber, glass, steel and finishing materials in contemporary buildings; Application of these materials in construction; Effects of sun, rain, wind and other climatic and environmental conditions on various building materials and built environment and the science of design for creating effective human comfort conditions within the built environment. understanding of parameters like U-factor, R-value, Thermal mass, Solar heat gain coefficient (SHGC), Visible light transmittance (VLT), etc.</p> <p>Traditional and conventional knowledge systems that enable construction of a complete building; various structural systems and methods of construction and detailing of buildings of medium complexity using natural and manmade materials including foundation, walls, roofs, staircase, joinery, and finishes; Technology that informs the construction of contemporary buildings using various structural systems and materials</p> |
| 2 | <p>CLIMATOLOGY AND BUILDING SERVICES</p> <p>Climatology as a science for the study of weather conditions averaged over a period of time; the elements of climate; study of human comfort; design of solar shading devices; Heat flow through building envelopes; Air movement due to natural and built form; Design strategies in different climate zones; vernacular and contemporary responses to climate, Concept of sustainability and Green buildings.</p> <p>Study of and design and detailing for water supply, drainage, sewage disposal, garbage disposal, electrification, illumination, air conditioning, fire hazard protection, acoustical treatment, rainwater harvesting, etc. in buildings and building premises, disaster management systems, intelligent energy conservation systems, electronic security and surveillance systems for buildings, etc.; compliance requirements w.r.t. National Building Code and Energy Conservation Building Code.</p> <p>Science of sound; conditions for good hearing; appropriate materials for sound insulation; approaches in history for acoustic planning; planning for good hearing conditions in auditoriums, classrooms, churches and halls, conference rooms, etc.</p> |
| 3 | <p>CULTURE, ARCHITECTURE AND HUMAN SETTLEMENT PLANNING</p> |

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| | <p>Architecture as evolving within specific cultural contexts including aspects of politics, society, religion, climate; geography and geology, etc. Development of architectural form with reference to Technology, Style and Character. Vernacular architecture as a process and not a product; Determinants of vernacular form; Overview of the various approaches and concepts to the study of vernacular architecture;</p> <p>Urban design as a discipline; Components of a city and their interdependent roles; Determinants of urban form; Evolution of historic urban form.; Theories and illustrations of Urban design and the interpretation of the urban form in different ways and layers; Identity and ‘place’ making; architectural codes and imageability; contemporary urban issues; sustainable urban design.</p> <p>Elements and characteristics of human settlements; origins; determinants and their evolution through the course of history; Settlements as expression of political aspirations; Various planning concepts in urban, rural and regional level development plans; Housing issues and design typologies.</p> |
| 4 | <p>LANDSCAPE, SITE PLANNING AND ARCHITECTURAL CONSERVATION</p> <p>Man and Nature; Landscape traditions; Elements and principles of landscape design; Aspects of outdoor design and site planning in enhancing and improving the quality of building environs, functionally and aesthetically; Site structure relationship; Analytic, artistic and technical aspects of designing open spaces at different scales; Role of Landscape design in sustainability.</p> <p>Site and its content in architectural creations; Influencing factors which governs the siting of a building or group of buildings in a given site; Topography analysis; Scientific techniques of site analysis- case studies; Methodology of preparing a site analysis diagram and mapping; Codes and building regulations; Site utilities and Infrastructure planning.</p> <p>Various issues and practices of Conservation; values and ethics; status of conservation and the various agencies involved in the field of conservation worldwide and their policies; various guidelines for the preservation, conservation and restoration of buildings; management of historic sites; study of various charters; character and issues in our heritage towns through case studies; Role of INTACH, UNESCO, ICOMOS and other such organization.</p> |
| 5 | <p>ARCHITECTURAL DESIGN AND THEORY</p> <p>The understanding the elements and principles of design as the building blocks of creative design. Principles and percepts of issues as related to architectural design in theory and practice; Appreciation of architecture with respect to man and his behavior; Nature and Design; Principles of organization on Nature; Ideas and Intent in design - Intuitive, contextual, Iconic, Experiential, Environmental, Energy based, Symbolic, Modular; Ideologies/ philosophies from the practice of architecture through contemporary history; design communication through graphics.</p> |
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| Books: Indicative list | |
| 1. | ASHRAE Handbook. |

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| 2. | A Primer on Theory on Architecture by Karen Spence |
| 3. | Rapoport, A. (1969), House Form and Culture, Prentice-Hall, Englewood Cliffs, NJ. |
| 4. | A History of Architecture, Sir Banister Fletcher |
| 5. | Kostof, Spiro, The City Shaped: Urban Patterns and Meanings Through History, Second edition, Thames & Hudson, New York 1999 |
| 6. | Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. McGraw-Hill Professional |
| 7. | Alexander, Christopher, et al. A pattern Language: Towns Buildings, Construction, Oxford 1977 |
| 8 | Manual of tropical housing and building – <i>Koenigsberger et al, Orient Longman, 1973.</i> |
| 9 | Building Construction Handbook by Roy Chudley |
| 10 | Building Services, Technology and Design By <u>Roger Greeno.</u> |

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
College of Architecture
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|------------------------------------|------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Advances in Architecture | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 08 | 04 |
| 4 | Research and Publication Ethics | 02 | | 30 | 20 | - | 50 | 02 | | 02 |
| Total | | 10 | 08 | 120 | 80 | 150 | 350 | 10 | 08 | 14 |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Ph.D. Course-work Syllabus

Paper-I
Research Methodology

| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
|--------------------------------|---|---------------------------------|
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |

Course Objectives:

- begin to formulate researchable problem in areas of research interest;
- write an effective research proposal or report;
- make appropriate choices about research strategies;
- review literature judiciously and systematically;
- understand and begin to apply the principles of collecting research data;
- understand and begin to conduct appropriate analyses of data;
- make appropriate choices about quantitative methods;
- demonstrate sensitivity to ethical issues raised by researchers;

Topics Covered

| | | |
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| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data</p> | (8 Hours) |

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| | collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection. | |
| UNIT-III | Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | (8 Hours) |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication. | (8 Hours) |
| UNIT-VI | Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor. Research Ethics: ethical issues in research, plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights. | (8 Hours) |

Assignments:

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| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |

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| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| | |

Text Books/References:

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| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Discipline: Architecture Ph.D. Course-work Syllabus Paper-II Advances in Architecture | | |
|--|---|---------------------------------|
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | University Examination : 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> ● Understand the application of visual research methods for architectural research. ● Understanding and interpreting the relationship between values, beliefs and their manifestations in the built environment. ● Understand and analyse various theories and concepts in relation to Architecture, Planning, Urban Design and allied fields ● Apply advance building systems and the Legal aspects in the Architecture Profession. ● Understand Pedagogy and establish its relationship with Architecture ● Know effect of climate change and need for sustainable cities | | |
| Topics Covered | | |
| UNIT-I | Society, Culture, and Architecture <ul style="list-style-type: none"> ● Cultural influences on Architecture. Cultural values and social behaviour and their reflection in shaping traditional spaces and contemporary layouts. Culture, cultural characteristics and importance of culture as a way of life. Cultural reflections in city patterns. ● Material culture (all the physical things that people create and attach meaning to). and nonmaterial culture (creations and abstract ideas that are not embodied in physical objects). Linkage and influence on the built environment. ● Society and Architectural identity. Reflection of societal norms and community principles through spatial and visual elements in the built environment. Society, social behaviour and the social determinants of physical form. ● Human activities and spaces. Society, beliefs, views and built expressions. Influence of ideas, values, beliefs, activities, relationships and forms of the social and spatial organizations that they sustain. | (10 Hours) |
| UNIT-II | Theories and concepts in Architecture and planning <ul style="list-style-type: none"> ● Architecture and Conservation: Descriptive, Explanatory, Normative for e.g Vitruvian, Classical, Personal Styles. Theories related to Conservation, Restoration and Adaptive Reuse | (10 Hours) |

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| | <ul style="list-style-type: none"> ● Planning and Urban Design: Principles of Ekistics; central place theory, concentric zone, gravity and sector model, neighbourhood and walkability concept, System Planning, Participatory planning, Advocacy planning, New urbanist, etc; Theories of Urban Design by Kevin Lynch, Jane Jacobs, Christopher Alexander etc. ● Environment and behaviour: Theories related to individual behavior and behavior change like theory of planned behavior, theory of reasoned action, place making, etc ● Sociology, Psychology, Economics and interdisciplinary subjects: The "hierarchy of needs" suggested by Abraham Maslow (1954), place attachment, social capital, hedonic pricing, right to the city, etc. | |
| UNIT-III | <p>Research Approaches in Architecture</p> <ul style="list-style-type: none"> ● Introduction to Architectural research approaches such as <ul style="list-style-type: none"> ○ Qualitative (Grounded theory, Ethnography, Interpretivism), simulation and modelling, case study, etc. ○ Need and significance of Visual Research methods. ○ Visual Research Methods in Architecture such as <ul style="list-style-type: none"> ▪ Observation ▪ Environmental mapping. ▪ Photo Interviewing. ▪ Videography in behavioural studies. ▪ Tracking for behavioural research. | (10 Hours) |
| UNIT-IV | <p>Advances in Building Technology, Systems and Services</p> <ul style="list-style-type: none"> ● Advance building technology such as 3D printing, technology for high-rise structures, etc. ● Innovations in construction management ● Innovative building materials ● Advances in Building Systems and subsystems such as BIM, automation, etc, relationship and analysis of sub-systems; Building systems for different building typologies, Optimization; Control systems for various buildings services, Types of controllers. ● Advances in Building Services such as services for high rise structures, integrating services. | (10 Hours) |
| UNIT-V | <p>Climate Change and Sustainable Architecture</p> <ul style="list-style-type: none"> ● Climate Change Science, Adaptation and mitigation <p>Climate Change Science, Trends and Impacts of Climate Change, Climate Change Adaptation and Mitigation, Low Carbon Development, Strategic Frameworks and Policy Approaches for Mitigation and Low Carbon Development.</p> | (10 Hours) |

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| | <ul style="list-style-type: none"> ● International Policies and Legal Framework for Climate Change and Planning for Climate Change <p>International Initiatives to Support Climate Change, The Climate Change Policy Framework, Provisions of the United Nations Framework Convention on Climate Change (UNFCCC), The Kyoto Protocol, Main Issues and Negotiation Streams. Planning of cities and other human settlements aiming towards SDG, Initiatives to reduce resource use and environmental impact of cities.</p> <ul style="list-style-type: none"> ● Sustainable Architecture: <p>Relationship between buildings and greenhouse gas emissions, climate and building, energy and resource conservation in buildings, occupant’s comfort and health, inclusive building design.</p> | |
| UNIT-VI | <p>Architecture Pedagogy and Professional Practice</p> <ul style="list-style-type: none"> ● Learning <ul style="list-style-type: none"> ○ Meaning and definition, Domains of Learning: Cognitive, Affective and Psychomotor, Methods of learning. ● Pedagogy in Architecture <ul style="list-style-type: none"> ○ Introduction to Principles of Teaching and Maxims of Teaching, Approaches of Teaching, Lesson Planning. ● Professional Practice <ul style="list-style-type: none"> ○ The architectural profession and the role of professional bodies and statutory bodies; Code of Conduct and ethics in professional practice and the mandatory provisions of the Architects Act 1972 ○ Copyright and Patenting in Architecture Profession, Arbitration, Easements, Consumer Protection Act | (10Hours) |
| Assignments: | | |
| IA | | |
| | Minimum 4 assignments based on above units | |
| UE will be based on above units with internal options. | | |
| Text Books/References: | | |
| 1. | Henry Sanoff. Visual Research Methods in Design. New York: Van Nostrand Reinhold, 1991 | |
| 2. | Robert Bechtel et al (eds). Methods in Environmental and Behavioral Research, NY:VanNostrand Reinhold, 1987. | |

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| 3. | Gary T Moore et al. Environmental Design Research Directions: Process and Prospect. New York: Preager Publishers, 1985. |
| 4. | Sanndren L. & Stone S. (2021) <i>Emerging Practices in Architectural Pedagogy: Accommodating an Uncertain Future</i> , London, Routledge |
| 5. | Boyer C.C., (1899), <i>Principles and Methods of teaching</i> , Philadelphia, J.B. Lippincott Company |
| 6. | Sharma T.C.,(2003), <i>Principles of Teaching</i> , Anmol Publications Pvt. Ltd. |
| 7. | Sharma T.C. (2004), <i>Meaning of lifelong learning</i> , New Delhi, Sarup and Sons. |
| 8. | Mangal S.K., (2011), <i>Advanced Educational Psychology</i> , New Delhi, PHI Learning Pvt. Ltd |
| 9. | Jyothi S.K.,Roa D.H.& Jha A.K.(2007), <i>Educational Research</i> , New Delhi, Sonali Publications. |
| 10. | Best J.W & Kahn J.V (2016), <i>Research in Education</i> , Pearson India Education services Pvt. Ltd |
| 11 | Salama A., (1995), <i>New Trends in Architecture Education: Designing the Design Studio</i> Raleigh, N.C.: Tailored Text. |
| 12 | Simons, H. (2009). Case Study Research in Practice. New Delhi, Sage. |
| 13 | Groat, L., & Wang, D. (Eds.). (2002). Architectural Research Methods: John Wiley and Son. |
| 14 | Zeisel, J. (2006). Inquiry by Design (Revised ed.). New York W.W.Nortan & Company |
| 15 | Climate Change and Sustainable Development: Global Perspective by R.K. Mishra, P.S. Janaki Krishna, et al. |
| 16 | Smart Cities for Sustainable Development (Advances in Geographical and Environmental Sciences) by Ram Kumar Mishra, Ch Lakshmi Kumari, et al. |
| 17 | Evaluating Climate Change Action for Sustainable Development / Uitto et al. |
| 18 | Sustainable Communities Design Handbook: Green Engineering, Architecture, and Technology, Second Edition |
| 19 | Planning Urban Futures with Reference to Sustainable Cities by Rosario Adapon Turvey |
| 20 | Transit Oriented Development and Sustainable Cities:Economics, Community and Methods |
| 21 | The SAGE Handbook of Architectural Theory by C. Greig Crysler - University of California, Berkeley, USA, Stephen Cairns - University of Edinburgh, UK,Hilde Heynen - Catholic Univeristy of Leuven, Belgium |
| 22 | A Primer on Theory of Architecture by Karen Spence |
| 23 | Design of Cities by Edmund Beacon |
| 24 | A reader in planning theory by Andreas Faludi |
| 25 | Namavati R.H,(2001), <i>Professional practice</i> , 2001, Lakhani Book Depot |
| 26 | Apte V.S., (2008), <i>Architectural Practice and Procedure</i> , Padmaja Bhide, Pune. |
| 27 | Rapoport, A. (1969), House Form and Culture, Prentice-Hall, Englewood Cliffs, NJ. |
| 28 | Rapoport, A. (1976), The Mutual Interaction of People and Their Built Environment. A Cross-cultural Perspective, Mouton, The Hague. |
| 29 | Jacob, Jane, The Death and Life of Great American Cities New York: Random House February 1993 [1961]. ISBN 0-679-60047-7. |
| 30 | Kostof, Spiro, The City Shaped: Urban Patterns and Meanings Through History, Second edition, Thames & Hudson, New York 1999 |
| 31 | Kostof, Spiro, The City Assembled: Elements of Urban Form through History, second printing Thames & Hudson New York 2005. |
| 32 | Alexander, Christopher, et al. A pattern Language: Towns Buildings, Construction, Oxford 1977 |

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY**

**Discipline: Architecture
Ph.D. Course-work Syllabus**

**Paper-III
Literature Survey and Presentation**

| | | |
|--|---|--|
| <u>TEACHING SCHEME:</u> Practicals: 8 Hours/Week | <u>EXAMINATION SCHEME:</u> TW/Oral :100 Marks | <u>CREDITS ALLOTTED:</u> Total Credits: 04 |
|--|---|--|

Course Objectives:

- To carry out systematic review literature and present the same

Topics Covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | Searching appropriate literature on broad area of research Identify Research Gap Citation and referencing styles | (32 Hours) |
| UNIT-II | Carry out literature review for selected area of research Compiling and organizing review Writing draft review | (32 Hours) |
| UNIT-III | Writing review-based paper and presentations | (32 Hours) |

Evaluation scheme:

Oral will be based on literature review carried out by the student.

Text Books/References:

1. Oliver, P. (2010). *Understanding the Research Process*. New Delhi: Sage.
2. Ridley, D. (2012). *The Literature Review: A Step-by-Step Guide for Students*: SAGE.
3. APA6 MANUAL

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nihs.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019). ISBN: 978-81-939482-1-7
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Board of Studies: Department of Chemical Engineering
PhD: Common Entrance Test (CET) and Course Work-Structure and Syllabus

CONTENTS

| Sr. No. | Description |
|----------------|---|
| 1 | Minutes of BoS meeting held on 13.12.2021 |
| 2 | PhD- Common Entrance Test-Syllabus |
| 3 | PhD- Course Work- Structure and Syllabus |

BHARATI VIDYAPEETH
(Deemed to be University)
COLLEGE OF ENGINEERING PUNE – 411043
Chemical Engineering Department

Date: 20 December 2021

Minutes of Meeting of Board of Studies in Chemical Engineering

A meeting of the BoS in Chemical Engineering was conducted on **13 December 2021 at 11:00 am**. Following members were present for the meeting as per notice of meeting dated **02 December 2021** (*Reference No.: BVDU/A15/2807/2021-2022*):

1. Dr. P. V. Chavan (Chairman)
2. Dr. S. M. Jadhav
3. Dr. S. N. Shinde
4. Dr. Y. J. Chendake
5. Mr. P. L. Chaudhari

The minutes of the meeting are as follows:

1. Confirmation of minutes of the previous meeting

Resolution: The minutes of previous meeting held on **22 September 2021 at 11 am** were read and confirmed.

2. Approval of Common Entrance Test (CET) Syllabus for Ph.D. Programme.

Resolution: The Common Entrance Test (CET) Syllabus for Ph.D. Programme has been discussed and subsequently approved. The Common Entrance Test (CET) Syllabus for Ph.D. Programme has been attached as Annexure I.

3. Approval of Structure and Syllabus for Pre-Ph.D. Course Work.

Resolution: The Structure and Syllabus for Pre-Ph.D. Course Work has been discussed and subsequently approved. The Structure and Syllabus for Pre-Ph.D. Course Work has been attached as Annexure II.

4. Any other items with permission of the chair.

Resolution: No other issues were discussed.

Meeting ended with the vote of thanks to the chair and members.

Bharati Vidyapeeth (Deemed to be University)

College of Engineering, Pune

Department of Chemical Engineering

Common Entrance Test (CET) Syllabus for Ph.D. Programme

Bharati Vidyapeeth (Deemed to be University)

Faculty of Engineering and Technology

Ph. D. Entrance Test Syllabus

Specific Subject: Chemical Engineering

Topics covered

Engineering Mathematics

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors; Calculus: Functions of single variable, Limit, continuity and differentiability, Taylor series, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima; Numerical methods for Chemical Engineering: Roots of polynomial equation, curve fitting, interpolation; Numerical differentiation and integration: Differentiation by Euler's, Runge Kutta, Milne' Predictor method, Integration by trapezoidal and Simpson's rule. Single and multi-step methods for numerical solution of differential equations.

Fluid Flow Operations

Fluid Statics; Newtonian and non-Newtonian fluid behavior; Flow of incompressible fluids in pipe: friction factor, Hagen Poisuille equation; Flow of compressible fluids: Processes of compressible flow, adiabatic frictional flow, isothermal frictional flow; Flow past immersed bodies: drag and drag coefficient, Kozeny-Carman equation, motion of particles through fluids, Fluidization: Conditions for fluidization, minimum fluidization velocity, applications of fluidization; Two phase flow: Gas/liquid, liquid/liquid and gas/solid flow, flow types and regimes in horizontal and vertical flow, regime map, behavior of non-Newtonian fluids in two phase flow.

Process Calculation and Chemical Engineering Thermodynamics

Basic Chemical Calculations; Energy balance; Material balance; recycle, bypass and purge calculations.

First and Second laws of thermodynamics: Applications of first law to close and open systems, second law and entropy; Thermodynamic properties of pure substances: Equation of state and residual properties; Properties of mixtures: Partial molar properties, fugacity, excess properties and activity coefficients; Phase equilibria: predicting VLE of systems, thermodynamic consistency of experimental equilibrium data; Chemical reaction equilibrium, Introduction to molecular thermodynamics of fluid phase equilibrium.

Heat Transfer and Mass transfer

Basic modes of heat transfer: Conduction, convection, radiation; Heat exchangers and evaporators: Design of double pipe, shell and tube heat exchangers, and single and multiple effect evaporators; boiling, condensation.

Fick's law of diffusion and mass transfer theories; Heat mass and Momentum analogies; HTU and NTU concept; Process design concepts of mass transfer equipments: distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification, and adsorption.

Chemical Reaction Engineering

Kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, kinetics of solid catalyzed reactions: diffusion with reaction in porous catalyst, mechanism of catalytic reactions, development of rate equations, estimation of kinetic parameters, external/internal mass and heat transfer resistances in catalyst particles; non ideal reactors; residence time distribution; single parameter model; non-isothermal reactors; rate and performance equations for catalyst deactivation.

Process Dynamics and Control

Transfer function and dynamic responses of various systems: first order, second order, interacting, non interacting, transportation lag, inverse response system; Controller modes P, PI, PID; Stability testing methods: Routh stability, Root locus, Bode diagram, Nyquist plot; Controller tuning: Z-N, Cohen Co, process reaction curve method; Control systems with multiple loops: MIMO control systems, interaction and decoupling of control loops; Advance control systems: cascade, ratio, smith predictor, selective control, adaptive and inferential control systems.

Project Engineering and Economics

Techno economic feasibility report; Primary utilities; Secondary utilities; Process design development; Process selection; Principles of process economics; Cash flow for industrial operation; Total product cost: Manufacturing cost, direct production cost, fixed charges, general expenses; Balance sheet; Depreciation; Break even chart; Plant location and layout; Critical path method (CPM); Program evaluation and review technique (PERT); Basic engineering data for plant design.

Text Books/References:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi, 2017.
2. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

| | |
|-----|---|
| 3. | S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, 6 th Edition, Tata-McGraw Hill Publications, 2012. |
| 4. | W. L. McCabe, J. C., Smith, and P. Harriott, Unit Operations of Chemical Engineering, McGraw-Hill, 6th. Ed., 2001 |
| 5. | J.M. Coulson, J. F. Richardson, J. R. Backhurst, J. H. Harker, Chemical Engineering Volume 1, 6th edition, Pergamon Press, 2003. |
| 6. | B. I. Bhatt and S. M. Vora, Stoichiometry (SI Units), 5th Ed., Tata McGraw Hill Publishers, New Delhi, 2010. |
| 7. | J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication |
| 8. | K.V. Narayanan, Chemical Engineering Thermodynamics, PHI Learning Pvt. Ltd. |
| 9. | J. P. Holman, Heat Transfer , 9th edn. The McGraw-Hill Companies, 2008 |
| 10 | D. Q. Kern, Process Heat Transfer, Tata McGraw-Hill Edition, 1997 |
| 11. | J. H. Wetly, C.E. Wicks and R. E. Wilson, Fundamentals of momentum, heat and Mass transfer, John Wiley and sons |
| 12. | A. L. Hines, and R. N. Maddox, Mass Transfer Fundamentals and Applications, Prentice Hall |
| 13. | C.J. King, Separation Processes, Tata McGraw Hill |
| 14. | G. F. Froment and K.B. Bischoff, Chemical Reactor Analysis and Design, John Wiley and Sons |
| 15. | J. M. Smith Chemical Engineering Kinetics, McGraw-Hill |
| 16. | W.H. Press, S A Teukolsky S.A., W. T. Vetterling, and B.P. Flannery, Numerical Recipes in Multi-Language Code, Cambridge University press |
| 17. | Sharma, M. M. and L. K. Doraiswamy, Heterogeneous Reactions, John Wiley and Sons |
| 18. | G. Stephanopoulos, Chemical Process Control :An Introduction to Theory and Practice, Prentice Hall |
| 19. | D.R. Coughanowr, Process Systems Analysis and Control, McGraw Hill |
| 20. | M. S. Peters and K. D. Timmerhaus, Plant Design and economics for chemical engineers, fourth edition, Mc Graw Hill Publications, 2002. |

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Chemical Engineering
Doctoral Programme- 2021

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Department of Chemical Engineering
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|--|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Chemical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | - | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 08 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-I****Research Methodology**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|----------------|---|------------------|
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |
| UNIT-II | Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection | (8 Hours) |

| | | |
|-----------------|---|------------------|
| | using a digital computer system, case studies of data collection. | |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing</p> <p>Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics</p> <p>Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work</p> <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |
| | | |

| Assignments | |
|-----------------------------------|---|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| Text Books/Reference Books | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, KedarNath Ram Nath& Co.,1972 |
| 5. | B.L.Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Multiphase Reaction Engineering**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total credit : 04 |

Topics Covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | Introduction to Multiphase Reactors Classification; Qualitative description of multiphase reactors; Application of industrial importance; Two case studies | (08 Hours) |
| UNIT-II | Thermodynamics and Kinetics Thermodynamic feasibility; Estimation of equilibrium constant; Determination of equilibrium composition; Determination of rate controlling step and overall rate of reaction. | (08 Hours) |
| UNIT-III | Hydrodynamic Characteristics Hydrodynamic characteristics of prominent multiphase reactors: Pressure drop; Force balance equations; Effect of geometrical, system, and operating parameters on hold-up profile; Velocity- hold-up relationships; Flow visualization techniques; Modelling and simulation | (08 Hours) |
| UNIT-IV | Mixing Characteristics Mixing characteristics of prominent multiphase reactors: Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors; Quantification of phase mixing; Development of a mathematical model. | (08 Hours) |
| UNIT-V | Heat Transfer and Mass Transfer Studies | (08 Hours) |

| | | |
|--------------------|--|-------------------|
| | <p>Heat transfer characteristics of prominent multiphase reactors: Effect of geometrical, system, and operating parameters on heat transfer coefficient; Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors.</p> <p>Mass transfer characteristics of prominent multiphase reactors: Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique; Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors; Quantification of mass transfer coefficient; Application of correlations available to different multiphase reactors.</p> | |
| UNIT-VI | Design of any two multiphase reactors of industrial relevance | (08 Hours) |
| Assignments | | |
| 1. | Enlist model reactors to discern rate controlling step and estimation of overall rate of reaction for a given multiphase system. Elaborate any one with reference to industrial case study. | |
| 2. | Study recent research articles (not less than five) on hydrodynamic aspects of any one multiphase system and prepare a conclusive report. | |
| 3. | Enlist flow visualization techniques. Elaborate any one for a given multiphase system. | |
| 4. | Enumerate recent modelling and simulation approaches for transport processes in any one multiphase system (A report and/or presentation). | |
| 5. | Study recent research articles (not less than five) on mixing aspects of any one multiphase system and prepare a conclusive report. | |
| 6. | Study of any one industrial case: Modification in multiphase system to reduce back-mixing. | |
| 7. | Report on recent advances in heat and mass transfer characteristics of a given multiphase system. | |
| 8. | Prepare a report and make a presentation on “Probable ways to enhance of heat and mass transfer rate” for a given industrial multiphase system. | |
| 9. | Visit chemical process industry and propose modification for any one multiphase system to increase profitability. | |
| 10 | Design multiphase system for a given operation/process on a commercial scale. | |

| Text Books/Reference Books | |
|-----------------------------------|--|
| 1 | L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 nd Edition, Volume I and II. |
| 2 | G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 th Edition, Academic Press, London, 1994 |
| 3 | W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000 |
| 4 | DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 nd Edition, Butterworth Heinemann, 1991. |
| 5 | J. F. Davidson and Harrison, "Fluidization", 10 th Edition, Academic Press, London, 1994 |
| 6 | V. G. Pangarkar, "Design of Multiphase Reactors", 1 st Edition, John Wiley, New Jersey, 2015 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Waste Water Treatment**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | <p>Introduction: Need of waste water treatment, sources of waste water, major constituents of waste water, impact of waste water on environment and mankind, conventional methods of waste water treatment, limitations of conventional waste water treatment methods.</p> <p>Physical and chemical methods of waste water treatment</p> <p>Physical methods: Screening, mixing, flocculation, gravity separation, grit removal, sedimentation, clarification, adsorption, filtration, floatation etc.</p> <p>Chemical methods: Coagulation, precipitation, phosphorus removal, disinfection and chemical oxidation etc.</p> | (8 Hours) |
| UNIT-II | <p>Biological methods of waste water treatment:</p> <p>Aerobic treatment processes: Activated sludge process, aerated lagoons, aerobic digestion, trickling filters, biological contactors etc.; Anaerobic processes: Anaerobic contact process, anaerobic digestion etc., Anoxic processes, Facultative processes.</p> <p>Advanced oxidation processes (AOPs):</p> <p>Introduction, Fundamentals and background of AOPs for water and wastewater treatment, basic reaction mechanism of AOPs</p> | (8 Hours) |
| UNIT-III | <p>Ozonation and Photo induced AOPs</p> <p>Ozonation: background and fundamentals, reaction kinetics and mechanisms, Application of homogeneous and heterogeneous catalytic ozonation in water</p> | (8 Hours) |

| | | |
|--------------------|--|------------------|
| | treatment; Fundamentals of UV irradiation: Absorption and bond dissociation energy, UV sources and their characteristics, Choice of photo source–used in AOPs; Photo induced AOPs: Mechanism of photo induced AOPs Oxidation using ultraviolet irradiation and hydrogen peroxide (UV/H ₂ O ₂), oxidation using ultraviolet irradiation and ozone (UV/Ozone), oxidation using combination of ultraviolet irradiation, hydrogen peroxide and ozone (UV/H ₂ O ₂ /Ozone). | |
| UNIT-IV | Heterogeneous Photo-Catalysis Fundamentals of semiconductor photo-catalysis: Various semiconductor particles used in photocatalytic applications, visible light driven photo-catalysts, photocatalytic reactions and kinetic studies and introduction to nanophoto-catalysis; Photocatalytic reactors: Solar energy driven or artificial light photo reactors, solar collectors, design of slurry or supported catalyst reactors, comparing reactor efficiencies and reuse of catalyst. | (8 Hours) |
| UNIT-V | Homogeneous and Heterogeneous Fenton processes Fenton process, photo-Fenton process, Advanced Fenton process, mechanism of Fenton based processes, merits and demerits of homogeneous and heterogeneous Fenton processes. | (8 Hours) |
| UNIT-VI | Emerging AOPs and its industrial applications Electrochemical oxidation, Ultrasound processes, principles of sonochemistry and acoustic cavitation, ultrasound cavitation and its combination with other AOPs, synergistic and antagonistic effects; hydrodynamic cavitation and its combination with other AOPs such as hydrogen peroxide, Ozone, Fenton, photo-Fenton etc. | (8 Hours) |
| Assignments | | |
| 1 | Preparation of technical report based on industrial applications of waste water treatment | |
| 2 | Preparation of power point presentation based on recent trends in photocatalysis | |
| 3 | Preparation of technical report based on ultraviolet irradiation and hydrogen peroxide for the degradation of dyes | |
| 4 | Study any three recent research papers related to advanced oxidation processes and prepare/present | |

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| | power point presentation. |
| 5 | Group discussions on any of the following topics: a) Merits and demerits of various AOPs b) Ozonation and Photo induced AOPs |
| 6 | Determine the ultrasonic power density of given ultrasonic processor |
| 7 | Prepare a technical report on recent trends in waste water treatment by ultrasound cavitation |
| 8 | Determine the hydraulic characteristics of any cavitating device |
| 9 | Prepare a technical report on recent trends in waste water treatment by hydrodynamic cavitation |
| 10 | Industrial case study –Application of AOPs in textile/ petroleum/ pharmaceutical industry |

Text Books/Reference Books

| | |
|----|--|
| 1. | Simon Parsons, Advanced oxidation processes for water and wastewater treatment, IWA Publishing, 2004. |
| 2. | Thomas Oppenlander, Photochemical Purification of Water and Air: Advanced Oxidation Processes (AOPs): Principles, Reaction Mechanisms, Reactor Concepts, Wiley-VCH Publishing, 2003. |
| 3. | Vincenzo Belgiorno, Vincenzo Naddeo and Luigi Rizzo, Water, wastewater and soil treatment by Advanced Oxidation Processes (AOP), Lulu Enterprises, 2011. |
| 4. | Jean-Pierre Franc, Jean-Marie Michel, “Fundamentals of Cavitation”, Kluwer Academic Publishers, Dordrecht. |
| 5. | T. J. Mason and J. P. Lorimer, “Applied sonochemistry: Uses of power ultrasound in chemistry and processing”, Wiley-VCH publishers. |
| 6. | Metcalf and Eddy, “Waste water Engineering Treatment and Reuse”, McGraw Hill Publishers |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Separation and Purification**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total Credit : 04 |

Topics Covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | Distillation Fundamentals of distillation, Multicomponent distillation, Rigorous method, Lewis-Matheson method, Thiele-Geddes method, Amundson-Pontinen method, Azeotropic and extractive distillation: Activity coefficient, equilibrium relationship, binary and ternary azeotropes, selection of solvent, calculations. | (08 Hours) |
| UNIT-II | Extraction Selection of extractant, distribution coefficient, extraction equipment stagewise operation, countercurrent operation, concurrent operation, multicomponent extraction, regeneration, regeneration efficiency, extractant selectivity | (08 Hours) |
| UNIT-III | Adsorption Preparation of Adsorbent Materials, Biosorbents, Determination of factors affecting adsorption, Properties of Adsorbent Materials, Structural parameters and models, Adsorption Analysis, Kinetics of adsorption and Adsorption rate equations, Isotherms – Langmuir, Freundlich and B.E.T., Mechanism of adsorption of cations, anions, organics and surfactants, Batch and Column dynamics, multisorbate sorption, Applications of Direct and | (08 Hours) |

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| | indirect measurement of adsorption of gases and vapours on adsorbent using various techniques, Bio-sorption, Industrial applications. | |
| UNIT-IV | Reactive Separations Types of Reactive separations: Reactive -distillation, extraction, adsorption, chromatography, crystallization, absorption; Fundamentals of Reactive separations: Thermodynamics and catalysis aspect; Kinetic experiments and Modeling; Batch and continuous study; Design of hardware; Modeling aspects of continuous systems; Industrial applications of Reactive separations | (08 Hours) |
| UNIT-V | Membrane separation Selection of membranes and processes, ultrafiltration, microfiltration, nanofiltration, reverse osmosis, gas separation, pervaporation, dialysis, electrodialysis, membrane formation, module formation, design of separation process, fouling and fouling reduction | (08 Hours) |
| UNIT-VI | Other separation techniques Zone melting, Separation based on thermal diffusion, Separation based on surface science, Adductive crystallization, affinity chromatography and immuno chromatography, Ionic separation | (08 Hours) |

Assignments

| | |
|----|--|
| 1. | Define and analyze distillation system and efficiency for industrial applications – Case study |
| 2. | Study of mass transfer equations for Multicomponent distillation. |
| 3. | Adsorption system design with regeneration and adsorbent life analysis. |
| 4. | Preparation of biosorbents with improved properties. |
| 5. | Thermodynamic study of the system involved in the separation |
| 6. | Kinetic experiments for the selected separation system |
| 7. | Prepare case study report on extraction and industrial application |
| 8. | Reactive extractant, properties of extractants and issues related the same during real life application – literature survey |
| 9. | Selection of membrane process and design of system based upon application and process conditions |

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| 10. | Issues during membrane process applications: fouling, concentration polarization and solutions regarding the same |
| 11. | Zone melting conditions and applicability – case study |
| 12. | Literature report Immuno chromatography and its biomedical applications |
| 13 | Literature review on recent developments on chromatographic separations. |
| 14 | Report on ionic separations, efficiency, importance and related issues |
| Text Books/Reference Books | |
| 1 | Barry C, Thomas W.J., “Adsorption Technology and Design” 1 st Edition, Elsevier 1998. |
| 2 | Douglas M. Ruthven, “Principles of Adsorption and Adsorption Processes”, 1 st Edition, Wiley-Interscience, 1984 |
| 3 | Bohumil Volesky, “Sorption and Biosorption”, 1 st Edition, St. Lambert, Quebec, 2003 |
| 4 | C. A. Alzate, M. O. Sanchez and P. Y. Andrianovich, Reactive Separation for Process Intensification and Sustainability, CRC Press, 2019, ISBN 9780367281519. |
| 5 | S. Kulprathipanja, Reactive Separation Processes, Taylor and Francis CRC press, Kindle edition, 2002. |
| 6 | Smith B. D., “Design of Equilibrium Stage Processes”, McGraw Hill Book Company Ltd., 2003 |
| 7 | King C. J., “Separation Processes”, McGraw Hill Book Company Ltd., 1980 |
| 8 | Marcel Moulder, “Basic Principles of Membrane Technology”, Prentice Hall, 1996 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Modelling and Simulation**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total credit : 04 |

Topics Covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | Modelling Fundamentals Classification of models; Model building and conservation principles; Steady state and dynamic models; Lumped and distributed parameter models; Solution strategies for lumped and distributed parameter models; Model calibration and validation. | (08 Hours) |
| UNIT-II | Phenomenological Modelling of Chemical Systems and Solutions Modeling of separation systems: Extraction, distillation, adsorption, membrane separation, reactive separations, waste water treatment and multiphase systems. | (08 Hours) |
| UNIT-III | Artificial Intelligence (AI)-based Modelling Introduction to Artificial Intelligence (AI); Applications of AI to Chemical Engineering; Introduction to various AI- based formalisms; Principal component analysis; Cause and effect relationships; Black box modelling; AI- based modelling formalisms: Artificial Neural Networks (ANNs); Genetic Programming (GP); Support Vector Regression; Fuzzy Logic (FL); Applications of these formalisms to Chemical engineering. | (08 Hours) |
| UNIT-IV | Artificial Neural Networks (ANNs) Biological background; ANN classification; Computational properties of | (08 Hours) |

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| | ANNs; Modelling a single neuron; Building blocks of feed-forward neural network: Bias, Processing elements, Input layer, hidden layer, Output layer, Learning rate, Momentum, Transfer function; Error back propagation. | |
| UNIT-V | Genetic Programming (GP) Introduction to evolutionary algorithms; Dependent variables; Independent variables; Mathematical operators; Initial population; Candidate solution; Tree structure; Initialization; Fitness evaluation and selection; Crossover; Mutation. | (08 Hours) |
| UNIT-VI | Simulation of Chemical Processes Simulation approaches: modular approaches, equation-solving approach; decomposition of networks: tearing algorithms, algorithms based on the signal flow graph, algorithms based on reduced digraph; Simulation of Engineering Systems: Monte-Carlo simulation, simulation of continuous and discrete processes, numerical methods to simulate engineering problems | (08 Hours) |
| Assignments | | |
| 1. | Write a mathematical model for unit operation and processes involved in selected chemical system | |
| 2. | Prepare a report on modelling and simulation of different chemicals systems | |
| 3. | Collect experimental data from literature and estimate unknown parameters for chemical reactors/heat exchanger/distillation unit. | |
| 4. | Modeling of distillation/extraction/adsorption/ absorption/ crystallisation for a problem from the literature | |
| 5. | Students have to study any five NPTEL videos related to Artificial Intelligence and prepare/present power point presentation. | |
| 6. | Group discussions on any of the following topics: a) Role of Artificial Intelligence in Chemical Engineering b) Phenomenological, empirical and AI-based modelling c) Artificial Intelligence and Chemical Industries | |
| 7. | Collect and read recent research papers on Artificial Neural Network and chemical process modelling and prepare summery report. | |
| 8. | Collect and read recent research papers on Genetic Programming and chemical process modelling | |

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| | and prepare summery report. |
| 9. | Analyse the results for case study with Principal Component Analysis and interpret the results. |
| 10. | Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments. |
| 11. | Solving numerical based on heat transfer using modelling and simulation concept. |
| 12. | Simulate the given problem by using computational tools like MATLAB/ ASPEN/ ChemCAD/ g-Proms |

Text Books/Reference Books

| | |
|---|--|
| 1 | K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001. |
| 2 | W. L. Luyben, "Process Modeling, Simulation and Control for Chemical Engineers", 2 nd Edn., McGraw Hill Book Co., New York, 1990. |
| 3 | B. P. Zeigler Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2 nd Edition. Academic press 2000 |
| 4 | A. K. Jana, Chemical Process Modelling and Computer Simulation, Prentice Hall India, 2 nd Edition, 2011 |
| 5 | J. Koza, Genetic Programming: On the Programming of Computers by Means of Natural Selection, MIT Press, Cambridge, MA, 1992. |
| 7 | C. M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press, Oxford, 1995. |
| 8 | S. S. Tambe, B. D. Kulkarni, and P. B. Deshpande, Elements of Artificial Neural Networks with Selected Applications in Chemical Engineering, and Chemical & Biological Sciences, Simulation & Advanced Controls Inc., Louisville, K.Y.,1996. |

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BVDU/IMED/68712021-22

Date: 29th October 2021

To,

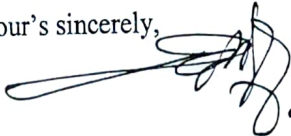
Shri G.Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune


Subject: Syllabus for PhD Course on Research and Publication Ethics


Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.

Your's sincerely,


Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.


Sr. Shashank Joshi
Dean Faculty of Engineering


Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

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| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

Ph. D. Entrance Test Syllabus

Specific Subject: Civil Engineering

Topics covered

| | |
|-----------------|---|
| UNIT-I | Hydraulics Engineering : Hydraulics: Types of fluid flows, Laminar and Turbulent fluid flow, Continuity, Momentum and Energy equations and their applications; Flow measurement in channels, Flow in pipes, Pipe networks. Hydrology: Hydrologic cycle, Rainfall, Evaporation, Infiltration, Unit Hydrographs; Irrigation, Duty, Delta, Crop water requirements; Gravity and Earth dams. |
| UNIT-II | Structural Engineering: Concrete: Concrete making materials and its properties; Mix design. Structural Mechanics: Analysis of flexure, Torsion, Shear, Compression and Tension; Shear force and Bending moment diagram, combined and direct bending stresses. Concrete Structures: Working stress and Limit state design concepts. Steel Structures: Plastic analysis and Limit state design concepts. |
| UNIT-III | Environmental Engineering: Water and Waste Water: Water standards, Surface water treatment, Distribution of water; Sewage and Sewerage treatment; Primary, secondary and tertiary treatment of waste water, characteristics of wastewater; Effluent discharge standards. Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits. Municipal Solid Waste Management: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal). |
| UNIT-IV | Geotechnical Engineering : Geotechnical: Index properties of soil, soil structure, Permeability, Seepage analysis, Compaction and Consolidation and shear strength. Foundation: Site explorations & investigations, Methods of soil exploration, Terzaghi's bearing capacity analysis, Pile foundations, Pile group and its efficiency. |
| UNIT-V | Surveying, Remote Sensing and Geographical Information System Surveying: Principles of surveying. Remote Sensing: Definition of RS, Benefits of RS over conventional method of surveying, Components of RS system. Geographical Information System: Fundamentals and components of GIS, Application of RS and GIS in Civil engineering. |

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| Text/References Books: | |
| 1. | Fluid Mechanics, Frank M. White, McGraw Hill publications |
| 2. | Open Channel Flow, Hanif Chowdhary, Springer publications |
| 3. | Mechanics of Solids, S. Crandall, N. Dahl and T. Lardner, McGraw-Hill publications |
| 4. | Structural Analysis, Hibbeler R. C., Prentice Hall publications |
| 5. | Wastewater Treatment and Reuse, Metcalf and Eddy, McGraw Hill publications |
| 6. | Foundation Analysis and Design, Bowles JE(1996), McGraw Hill publications |
| 7. | Advanced Soil Mechanics, Das. B. M(1997), Taylor and Francis publications |
| 8. | Basics of Remote Sensing and GIS, Dr. S Kumar, Laxmi publications |

Bharati Vidyapeeth (Deemed to be University)
Faculty of Engineering and Technology
Revised Structure of Pre. Ph. D. coursework (2021)
Civil Engineering

| Sr. No. | Subject | Teaching Scheme | | Examination Scheme (marks) | | | | Credits |
|---------|---|-----------------|----------|----------------------------|---------------------|---------------|------------|-----------|
| | | L | P/D | Theory examination | Internal assessment | Presentations | Total | |
| 1 | Paper- I: Research Methodology | 4 | - | 60 | 40 | - | 100 | 04 |
| 2 | Paper –II : Research Area Specific | 4 | - | 60 | 40 | - | 100 | 04 |
| 3 | Literature survey and presentation | | 4 | - | 50 | 50 | 100 | 04 |
| 4 | Paper –IV: Research Publications and Ethics | 2 | 2 | 30 | 20 | | 50 | 02 |
| | Total | 10 | 6 | 150 | 150 | 50 | 350 | 14 |

List of Research Area Specific Subjects Paper -II

- 1 Hydraulic Engineering
- 2 Environmental Engineering
- 3 Structural Engineering
- 4 Traffic and Transportation Engineering

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-I****Research Methodology**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology(ICT) in research,maintaining literature data using software tools,tabulation and graphical presentation of research data,use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |
| UNIT-II | Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection,selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection. | (8 Hours) |
| UNIT-III | Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | (8 Hours) |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. | (8 Hours) |

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|----------------|---|------------------|
| | <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |

Assignments:

| | |
|-----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| | |

Text Books/References:

| | |
|----|--|
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma, Operational Research, KedarNath Ram Nath & Co., 1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Pre-Ph.D. Course-work Syllabus****Paper-II Research Area Specific Subject : 1 Hydraulic Engineering**

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | FLUID MECHANICS Types of fluid flow, continuity equation, circulation and vorticity, stream function and velocity potential function. Dynamics of fluid flow, Euler's equation of motion, Bernoulli's equations and its applications. Dimensional analysis. | (08 Hours) |
| UNIT-II | ADVANCED FLUID MECHANICS Viscous flow ,laminar and turbulent flows and, Navier Stokes equation of motion, Boundary layer theory and , momentum equation for boundary layer, separation of boundary layer, Analysis of flow using CFD technique. | (08 Hours) |
| UNIT-III | OPEN CHANNEL FLOW Gradually varied flow, governing equations, computation of GVF in prismatic and non prismatic channels, rapidly varied flow and application of Momentum equation, Transient flow analysis. | (08 Hours) |
| UNIT-IV | HYDROLOGY Unit Hydro graph, S-curve and IUH, Clark's method of IUH. Synthetic Unit-hydrograph. Floods: Frequency analysis, normal, log-normal and Gumbel's distributions, envelope curves, empirical formulae and regional flood frequency analysis. | (08 Hours) |
| UNIT-V | WATER RESOURCES ENGINEERING Hydraulic structures such as Gravity dams, Earthen dams, Rock fill dams, Barrages ,Bridges, Spillways, Energy dissipators, | (08 Hours) |
| UNIT-VI | SEDIMENT TRANSPORT Sediment problems, significant sediment properties, beginning of sediment movement – Shields analysis, critical tractive stress of non uniform sediments. Bed Forms and Resistance: Description of bed forms, flow regimes, their significance, resistance analysis, different resistance laws. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units**Text Books/References:**

1. Shames, "Mechanics of Fluids", McGraw Hill,2000
2. V.T.Chow, "Applied Hydrology", Tata McGraw Hill Publication,2005

| | |
|----|---|
| 3. | Garde R. J., Ranga Raju K. G., “Mechanics of Sediment Transportation and Alluvial Stream Problems” , New Age International (P) Limited, New Delhi, 2004 |
| 4. | V. T. Chow, “Open Channel Flow”,McGraw Hill Publication, 1990 |
| | |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper-II Research Area Specific Subject : 2 Environmental Engineering

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

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|-----------------|---|-------------------|
| UNIT-I | <p>WATER TREATMENT</p> <p>Aeration: Types of aerators, gravity aerator and fixed spray aerator.</p> <p>Sedimentation: Plain Sedimentation, Principles and types of plain Sedimentation, Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator; Tube settlers: Introduction</p> <p>Filtration: Theory of filtration, types of filters, design criteria, working and washing of rapid sand filter, design of rapid sand filter.</p> <p>Disinfection of water</p> <p>Advance Treatment Methods: Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.</p> | (08 Hours) |
| UNIT-II | <p>SEWAGE TREATMENT</p> <p>Characteristics of sewage – Physical, Chemical, Biological. Introduction to unit operations and processes.</p> <p>Primary, Secondary and tertiary treatment</p> <p>Disposal: Methods and effluent standards for disposal of sewage Sludge treatment</p> | (08 Hours) |
| UNIT-III | <p>INDUSTRIAL WASTE WATER TREATMENT: Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater. Sources, characteristics, treatment & disposal of effluent for the following industries: Sugar, dairy and Pulp & Paper. Effluent Discharge standards as per CPCB norms. Introduction to concept of CETP (Common Effluent Treatment Plant.)</p> | (08 Hours) |
| UNIT-IV | <p>AIR POLLUTION:</p> <p>Classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards, Meteorology and Gaussian dispersion model.</p> <p>Air Pollution Control: Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric</p> | (08 Hours) |

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| | filters, and electrostatic precipitators. | |
| UNIT-V | SOLID AND HAZARDOUS WASTE MANAGEMENT: Waste Generation, Composition, Source reduction of wastes, Handling and segregation of wastes at source, storage and collection, Transport, Waste processing, Composting, Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation, Integrated Solid waste management: Principles and Elements of Integrated Solid waste management | (08 Hours) |
| UNIT-VI | ENVIRONMENTAL MANAGEMENT: Introduction, Principle, Fundamentals Environmental Management Systems- Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling, Environmental Management Tools: Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits Environmental Legislation: Rules and Regulations of Environmental laws in India (Water and Air), | (08 Hours) |
| Internal Assessment will consist of assignments based on above six units | | |
| Text Books/References: | | |
| 1. | Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981. | |
| 2. | Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995. | |
| 3. | Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985. | |
| 4. | George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993 | |
| 5 | CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000. | |
| 6 | Dr. M. N. Rao and Dr. Razia Sultana, ‘ Solid and Hazardous Waste management’ BSP Books Pvt. Ltd. 2012 | |
| 7 | I. V. Murali Krishna and ValliManickam, ‘Environmental Management’, BSP, Books Pvt. Ltd. 2014 | |
| 8 | S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977. | |
| 9 | Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997. | |
| 11 | Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006. | |
| 12 | C.L. ell, Solid Waste Management, John Wiley, 1975 | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Pre-Ph.D. Course-work Syllabus****Paper-II Research Area Specific Subject :3 Structural Engineering**

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | SOLID MECHANICS Determination of axial stress, bending stress and shear stress developed in member at particular location in the cross section. Calculation of principal stresses and location of principal planes. | (08 Hours) |
| UNIT-II | ANALYSIS OF STRUTURES Analysis of determinate and indeterminate beams, frames and trusses in plane. Determinations of support reactions, Calculation of member forces - axial force, shear Force and bending Moment at particular section in the member. Deflected shape of the structure. | (08 Hours) |
| UNIT-III | CONCRETE TECHNOLOGY AND COMPOSITES Materials for Concrete, Properties and Testing of Materials, Properties of Concrete, I.S. Code Requirements, Methods of Mix design Modern and Special Concreting Techniques, Advanced Concrete Materials, Concrete Composites, Nan concrete. | (08 Hours) |
| UNIT-IV | DESIGN OF STEEL STRUCTURES Load calculation, Design load, Concept of limit state design. Design of members for axial tension and compression force, Flexure and shear using structural steel. Design of bolted and welded connections. | (08 Hours) |
| UNIT-V | DESIGN OF R.C.C.STRUCTURES Concept of R.C.C., Stress block Parameters, Concept of under reinforced, balanced over reinforced section, Analysis and design of rectangular, flanged and doubly reinforced beams. Design of slabs, beams, columns and footings. Analysis of special structures –Retaining wall, combined footing, Water Tanks, Frames. | (08 Hours) |
| UNIT-VI | EARTHQUAKE RESISTANT STRUCTURES Determination of EQ loads – Static , Dynamic Method Concept of Single degree , Multiple degree Freedom System , Concept of Shear Wall, Design of a shear wall Ductile Detailing, Use of I.S. 13920 for ductile detailing. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units

Text Books/References:

1. Timoshenko and Goodier-Theory of Elasticity, McGrew-Hill publications.

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| 2. | S.Crandall, N.Dahl and T.Lardner-Mechanics of Solids McGrew-Hill publications |
| 3. | Anil K Chopra-Dynamics of Structures -Theory and Applications to Earthquake Engineering, Prentice-Hall publications. |
| 4. | R.W.Clough and J.Penzin- Dynamics of Structures McGrew-Hill publications |
| 5 | R.C.Roy –Structural Dynamics an Introduction to Computer Methods, John Wiley &sons publications |
| 6 | S. Timoshenko and W.Krieger, Theory of plates and Shells, McGrew-Hill. |
| 7 | Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication |
| 8 | V. L. Shah and Dr. S. R. Karve , “Limit State Theory and Design”, Pune VidyarthiGriha Publications |
| 9 | S.K.Duggal. “ Earthquake Resistant Design” – Oxford Publications |
| 11 | Hibbeler R.C., “Mechanics of Materials”, Pearson Prentice Hall, |
| 12 | Beer F..P. and Johnston E.R., “Mechanics of Materials”, McGraw Hill Publication |
| 13 | Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication |
| 14 | N. Subhramanian, “ Design of Steel Structures”, Oxford University Press |
| 15 | N. Subhramanian, “ Design of R.C.C. Structures”, Oxford University Press |
| 16 | IS:800-2007, General Construction in Steel - Code of Practice |
| 17 | IS:808-1989, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections |
| 18 | IS:456-2000, “ Code of Practice for Plain and reinforced Concrete Structures” |
| 19 | IS: 1893- 19 ,” Code of Practice for Earhquake design |
| 20 | IS: 13920-Code of Practice for Dctile detailing of Earthquake Resistant Structures |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper-II - Research Area Specific Subject : 4 Traffic and Transportation Engineering

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

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|-----------------|--|-------------------|
| UNIT-I | Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics - IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads - PCU concept and its limitations - Road user facilities - Parking facilities - Cycle tracks and cycleways - Pedestrian facilities. Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies. | (08 Hours) |
| UNIT-II | Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelisation - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination. | (08 Hours) |
| UNIT-III | Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Road. | (08 Hours) |
| UNIT-IV | Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures | (08 Hours) |
| UNIT-V | Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. | (08 Hours) |
| UNIT-VI | Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units.

Text Books/References:

1. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons

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| 2. | Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc. |
| 3. | Khanna and Justo, Highway Engineering |
| 4. | Kadiyali L.R. Traffic and Transportation Planning |
| | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
FACULTY OF ENGINEERING AND TECHNOLOGY

Ph.D. Course-work Syllabus

Literature Survey and Presentation

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|--------------------------------|-------------------------|
| Lectures : - | End Semester Examination :-- | Theory : -- |
| Practical : 4 Hours/Week | Internal Assessment :50 Marks | TW/ Oral :04 |
| | External Assessment : 50 Marks | Total Credits : 04 |
| | | |

Evaluation

Internal Assessment (50 marks)

Candidates have to submit a synopsis that should include Introduction, literature review, objectives of the research, research methodology and conclusions.

External Assessment (50 marks)

Candidates have to give the presentation of the research topic.

Objectives of the course

Candidates should search for appropriate literature on broad area of research, identify research gap, carryout literature review of selected area of research, decide the objectives of the research and workout the methodology for research.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper 04 - Research Publications and Ethics

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| | Theory Examination: 30 Marks Internal assessment : 20 Marks | Total credits: 02 |
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Course Title: Course for awareness about the publication ethics and publication misconduct.

Overview: This course has total six units focusing on basics of philosophy of science and ethics, research integrity, publication. Hands on sessions are designed to identify research misconduct, and predatory publications. Indexing and citation databases, open access publications, research metrics (Citations , h-index, Impact Factor etc.) and plagiarism tools will be introduced in this course.

Pedagogy: Class room teaching, guest lectures, group discussion and practical sessions.

Evaluation: Total Marks 50: (20 IE +30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

Syllabus in detail (Theory)

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| UNIT-I | <p>Philosophy and Ethics:</p> <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | (04 Hours) |
| UNIT-II | <p>Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (04 Hours) |
| UNIT-III | <p>Publication Ethics:</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents | (07 Hours) |

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| | Practical | |
| UNIT-IV | Open Access Publishing: 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | (04 Hours) |
| UNIT-V | Publication Misconduct: A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review proces B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other | (04 Hours) |
| UNIT-VI | Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (07 Hours) |

References:

1. Bird,A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics.London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a> 6o
8. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019). ISBN: https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoos Responsible conduct of Research: Oxford University Press
10. Comstock: Research ethics:Cambridge university Press
11. Robin: Research ethics: Indiana University press
12. Tony Mayer: Promoting Research Integrity in a Global Environment: World Scientific Publishing
13. Paul Oiver: The Student's Guide to ResearchEthics:Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance: Indian National Science Academy
15. David V Thiel : Research methods for Engineers: Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Femanda Menéndez. (2013). Practices of Ethics: An Empirical

Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.

17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.

18. Clive Opie (2004). Doing Educational Research A Guide for First time researchers. New Delhi: Vistar Publications.

19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.

20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethies of Science. Switzerland.Springer International Publishing

Bharati Vidyapeeth
(Deemed to be University), Pune
Faculty of Engineering and Technology

Board of Studies in Computer and IT Engineering

Minutes of Meeting

The meeting of Board of Studies of BV(DU) Pune was held on 11th December 2021 at 12:00 pm in the Computer Engineering Department, BV(DU)COE Pune -43.

Following members were present for the meeting...

1. Chairman Prof. Dr. S. H. Patil
2. Prof. Dr. S. B. Vanjale
3. Prof. Dr. Prakash Devale
4. Dr. Bindu Garg
5. Dr. J Naveenkumar
6. Dr. Amol Kadam

Dr. Pramod Jadhav was absent with prior permission for meeting.

The following points were discussed in the meeting.

Item No 1

Confirmation of the minutes of the previous meeting.

Resolution

The minutes of the previous meeting were read and discussed with the members.

Item No. 2

To restructuring Ph.D. CET syllabus and course work.

Resolution

The members were asked to share their views on the course names and research trends in the various courses related to computer engineering and information technology. Based on the research trends and advancement in the foundational courses like Database management systems, Data mining, Computer architectures, system software, software engineering four courses were proposed for course work of Ph.D. in Computer and IT engineering by the members. The four courses were finalised and accepted unanimously. The courses are Advanced Software Engineering, Data Science and Intelligent Computing, Advanced System architecture and Software and Modern Networking. The detailed Syllabus of the courses is attached as annexure with this minute.

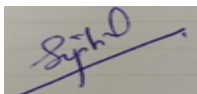
Item No. 3

Any other item with permission of the chair

Resolution

Revision and Appointment of Internal and External Examiners are made for the different courses. The same information is shared with University Exam Section.

The Meeting concluded with thanks to the chair.



Prof. Suhas Patil

Chairman Board of Studies

Computer Engineering & IT

Bharati Vidyapeeth (Deemed to be University), Pune-30.

Bharati Vidyapeeth
(Deemed to be University), Pune

Syllabus for Ph. D. Entrance Exam

Computer Engineering

Section – II

| Unit No. | Syllabus |
|----------|--|
| 1 | Mathematical Foundation and Data Structures and Algorithms: Sets, Propositions, Relations, Functions, Graphs, Introduction to Probability theory, Theory of Computation: Formal Languages, Types of Grammars and Languages, Chomsky classification of Languages, Recursive and recursively enumerable sets, Operations, Theory of Automata: Finite State Models, Minimization, Regular sets and Regular Grammars, Pumping Lemma, Closure properties, Applications of Finite automata, Context Free Grammar and Push Down Automata, equivalence of PDA and CFG, Deterministic PDA, Normal forms, Applications of CFG, Turing machines and Linear Bounded Automata. Abstract Data Types: Arrays, Polynomial, Sparse Matrices, Strings, Stacks & Queues, Multiple Stacks & Queues and its applications, Linked Lists: Singly Linked Lists, Reusable Linked List Class, Circular Lists, Linked Stacks & Queues, Polynomials, Equivalence Classes, Sparse Matrices, Doubly Linked Lists, Generalized Lists. Complexity Analysis. Trees: types, Graphs: Operations, complexity analysis, sorting: types, operations and its complexity analysis, Symbol Tables: Static Hashing - Dynamic Hashing, Heap Structures, Advanced data structures: Optimal binary search tree |
| 2 | Computer Organisation and Architecture: Boolean algebra and Minimization of Boolean functions, Flip-flops-types, Race condition and comparison. Design of combinational and sequential circuits. Representation of Integers: Octal, Hex, Decimal, and Binary. 2's complement and 1's complement arithmetic. Floating point representation. Combinational Circuit Design, Sequential Circuit Design. Hardwired and Micro- programmed processor design, Instruction formats, addressing modes, memory types and organizations, Interfacing peripheral devices, Interrupts. Microprocessor architecture, Instruction set and Programming (8086, P-III/P-IV). Microprocessor applications. Assembly language fundamentals (8085 based assembly language programming). Assemblers -2-pass and single-pass. Macros and |

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| | <p>macro-processors. Loading, linking, relocation, linkage editing. Text editors. Programming environments. Debuggers and program generators. Compilation and Interpretation. Bootstrap compilers. Phases of compilation process. Lexical analysis. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom-up parsers –Shift-reduce, operator precedence, and LR. YACC package on Unix system. Top-down parsers-left recursion and its removal. Recursive descent parser. Predictive parser. Intermediate codes-Quadruples, Triples, Intermediate code generation, Code generation, Code optimization.</p> |
| 3 | <p>Computer Programming and Analysis & Design of Algorithms: Programming language concepts, paradigms, and models. Programming in C: Elements of C-Tokens, identifiers, data types, operators in C. Control structures in C. Sequence, Selection, and iterations (s). Structured data types in C-arrays, struct, union, String, and pointers. I/O statements, User defined and built-in functions, Parameter passing. Object Oriented Programming Concepts: Class, Object, Instantiation, Inheritance, polymorphism and overloading, dynamic biding, reference semantics and their implementation. Algorithm specification and Characteristics, Divide and Conquer: General method, Binary search, Maximum and Minimum, Merge sort, Quick sort, Selection sort, Strassen’s Matrix multiplication, Greedy: General method, Knapsack problem, Job sequencing with deadlines, MST, Optimal storage on tapes, Optimal merge pattern, Single source shortest path. Dynamic Programming: General method, Multistage graph, All Pair Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack., Backtracking: General method, 8-Queens problem, Sum of Subsets, Graph Colouring, NP-hard and NP- complete problems, time and space complexity.</p> |
| 4 | <p>Operating System and Computer Networks : Types of Operating Systems, Features and Functions of the Operating System, Process Management, Process Synchronization and Deadlocks, Memory Management, File System, Disk Management, Unix system, Filters and Commands, System Calls, Agreement Protocols for handling Processor Failures, Distributed Mutual Exclusion, Distributed Operating Systems, Local and Global states, Failure Handling and Recovery Mechanisms, Multiprocessor Operating Systems and related Thread Handlings, Token and Non-token based Algorithms, Network fundamentals : Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks. Topologies, Networking Devices. The OSI model, TCP/IP model. Protocols for –(i) Data link layer, (ii) Network layer, and (iii) Transport layer, TCP/IP protocols, Networks security, Network administration. Application layer</p> |

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| | protocols, Flow and error control techniques, Introduction to intelligent networking, Performance analysis of networks. |
| 5 | Database Management System and Software Engineering: Relational Database Design, E-R and E-E-R Model, Architecture, Relational model, Relational Algebra, Relational Calculus, Relational design, Normalization, 1NF, 2NF, 3NF, BCNF and 4NF. Indexing and Hashing, Storage and File Structures, Transaction Management, Concurrency Control. SQL: Joins, SQL/PL-SQL. Data mining and its algorithms, OLAP, OLTP. Advanced Database systems: Parallel Databases, Distributed Databases, NoSQL Databases, Spatial Database, Multimedia Databases, Mobile Databases and Web-enabled Database Systems. Software life cycle models: Prescriptive Models, Specialised process Models, Agile Development Process, Requirement Engineering, feasibility analysis, Domain specific modelling, Software Design, Systems Modelling Language, Software architecture and design patterns, user interface design, Software Coding, Testing, Testing strategies, Software reliability and Advanced testing techniques, Software Quality management, Software Metrics, Software Configuration, Software maintenance and reengineering, Software project management - Planning and managing the project, Aspect oriented programming. |

Books:

| | |
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| 1. | Mathematical Foundation: Kenneth Rosen |
| 2. | Data Structures and Algorithms Aho Ullman |
| 3. | Computer Organisation and Architecture: John P. Hayes |
| 4. | System Software: Dhamdhare Dhananjay |
| 5. | Computer Programming: Rajaraman |
| 6. | Analysis & Design of Algorithms: Hurwitz Sahani |
| 7. | Operating System: William Stalling |
| 8 | Computer Networks: Tannenbaum |
| 9 | Database Management System: Korth |
| 10 | Software Engineering: Pressman |

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Bharati Vidyapeeth
(Deemed to be University)
Pune, Maharashtra, India

Faculty of Engineering and Technology

Ph.D. (Computer Engineering)

Course Work Scheme and Syllabus

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|--|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Computer Engineering* | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | 02 | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 10 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

***Programme Specific Courses (Anyone to be opted)**

- Advanced Software Engineering
- Data Science and Intelligent Computing
- Advanced System Architecture and Software
- Modern Networking

Paper-I

Research Methodology

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|--------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | <p>Introduction</p> <p>Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.</p> <p>Role of information and communication technology(ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature</p> <p>Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review</p> <p>Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation</p> <p>Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection</p> <p>Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing</p> | (8 Hours) |

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| | Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication. | (8 Hours) |
| UNIT-VI | Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor. Research Ethics: ethical issues in research, plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights. | (8 Hours) |

Assignments

| | |
|----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |

| | |
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| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |

Textbooks/References:

| | |
|----|--|
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma, Operational Research, Kedarnath Ram Nath & Co., 1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

| Advanced Software Engineering | | | |
|--|-------------------------------|--------------------------|--|
| | | | |
| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Requirement Engineering and Estimation | | | |
| Requirements engineering: Requirements Elicitation, Requirement Elicitation techniques, Requirement Analysis, Requirement Analysis Models, Requirement Documentation, Requirement Management. | | | |
| Size Estimation: Function Point Analysis from DFD's, ER diagram, Function Point Analysis from Use Case Diagram & Class Diagram, Mask II FPA, LOC estimation, Conversion between size measures, Effort, schedule & cost estimation: Estimation factors, COCOMO-II, Estimation by Analogy, Validating Software Estimates. | | | |
| Unit II: Software Design | | | |
| Software Design Fundamentals: General Design Concepts, Context of Software Design, Software Design Process, Software Design Principles | | | |
| Key Issues in Software Design: Concurrency, Control and Handling of Events, Data Persistence, Distribution of Components, Error and Exception Handling and Fault Tolerance, Interaction and Presentation, Security Software Structure and Architecture: Architectural Structures and Viewpoints, Design Patterns, Architecture Design Decisions, Families of Programs and Frameworks | | | |
| User Interface Design: General User Interface Design Principles, User Interface Design Issues, The Design of User Interaction Modalities, The Design of Information Presentation, User Interface Design Process, Localisation and Internationalisation, Metaphors and Conceptual Models | | | |
| Software Design Quality Analysis and Evaluation, Software Design Notations, Software Design Strategies and Methods, Software Design Tools | | | |
| Unit III: Software Construction & Testing | | | |
| Software Construction Fundamentals, Minimizing Complexity, Anticipating Change, Constructing for Verification, Reuse, Standards in Construction, Construction in Life Cycle Models, Construction Planning, Construction Measurement, | | | |
| Practical Considerations: Construction Design, Construction Languages, Coding, Construction Testing, Construction for Reuse, Integration, Construction Technologies, Software Construction Tools, Development Environments, GUI Builders, Unit Testing Tools, Profiling, Performance Analysis, and Slicing Tools. | | | |
| <u>Software Testing Fundamentals</u> : Key Issues, Relationship of Testing to Other Activities, Test Levels, The Target of the Test, Objectives of Testing, Test Techniques, Based on the Software Engineer's Intuition and Experience, Input Domain-Based Techniques, Code-Based Techniques, Fault-Based Techniques, Usage-Based Techniques, Model-Based Testing Techniques, Techniques Based on the Nature of the Application, Selecting and Combining Techniques, Test-Related Measures: Evaluation of the Program Under Test, Evaluation of the Tests Performed, Test Process, Practical Considerations, Test Activities | | | |

Software Testing Tools: Testing Tool Support, Categories of Tools.

Unit IV: Software Configuration Management and Maintenance

Management of the SCM Process, Organizational Context for SCM, SCM Plan, Software Configuration Identification, Identifying Items to Be Controlled, Software Library, Software Configuration Control, Requesting, Evaluating, and Approving Software Changes, Implementing Software Changes, Software Configuration Status Information, Software Configuration Status Reporting, Software Configuration Auditing, Software Release Management and Delivery, Software Configuration Management tools.

Software Maintenance Fundamentals, Nature of Maintenance, Need for Maintenance, Majority of Maintenance Costs, Evolution of Software, Categories of Maintenance

Key Issues in Software Maintenance: Technical Issues, Management Issues, Maintenance Cost Estimation, Software Maintenance Measurement,

Maintenance Process, Maintenance Activities, Program Comprehension, Reengineering, Reverse Engineering, Migration, Retirement, Software Maintenance tools.

Unit V: Software Engineering Process, Models and Methods

Software Process Definition, Software Process Management, Software Process Infrastructure

Software Life Cycles: Categories of Software Processes, Software Life Cycle Models, Software Process Adaptation, Practical Considerations.

Software Process Assessment and Improvement: Software Process Assessment Models, Software Process Assessment Methods, Software Process Improvement Models, Continuous and Staged Software Process Ratings.

Software Measurement: Software Process and Product Measurement, Quality of Measurement Results, Software Information Models, Software Process Measurement Techniques, Software Engineering Process Tools.

Modelling: Modelling Principles, Properties and Expression of Models, Syntax, Semantics, and Pragmatics, Preconditions, Postconditions, and Invariants.

Types of Models: Information Modelling, Behavioural Modelling, Structure Modelling.

Analysis of Models: Analysing for Completeness, Analysing for Consistency, Analysing for Correctness, Traceability, Interaction Analysis

Software Engineering Methods: Heuristic Methods, Formal Methods, Prototyping Methods, Agile Methods.

Unit VI: Software Quality

Software Quality Fundamentals: Software Engineering Culture and Ethics, Value and Costs of Quality, Models and Quality Characteristics, Software Quality Improvement, Software Safety.

Software Quality Management Processes: Software Quality Assurance, Verification & Validation, Reviews and Audits.

Practical Considerations: Software Quality Requirements, Defect Characterization, Software Quality Management Techniques, Software Quality Measurement, Software Quality Tools.

References

- [1] P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014; www.swebok.org.
- [2] Maxim, B. R., Pressman, R. S. (2014). Software Engineering: A Practitioner's Approach. United Kingdom: McGraw-Hill Education.
- [3] Sommerville, I. (2011). Software Engineering, 9/e. India: Dorling Kindersley.

| Data Science and Intelligent Computing | | | |
|--|-------------------------------|--------------------------|--|
| | | | |
| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Big Data and Data Science | | | |
| Current landscape of perspectives, Statistical Inference - Populations and samples - Statistical modelling, probability distributions, fitting a model, Exploratory Data Analysis and the Data Science Process - Basic tools., Feature Generation and Feature Selection algorithms, Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis, Mining Social-Network Graphs, Data Visualization. | | | |
| Unit II: Statistical Computing | | | |
| Probability Theory: Sample Spaces- Events - Axioms – Counting - Conditional Probability and Bayes’ Theorem – The Binomial Theorem – Random variable and distributions, Curve Fitting and Principles of Least Squares- Regression and correlation, The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Sampling distributions (Chi-Square, t, F, z). Test of Hypothesis, Tabular data- Power and the computation of sample size, Linear models- Logistic regression- Rates and Poisson regression, Nonlinear curve fitting. Density Estimation- Recursive Partitioning, Multidimensional Scaling Cluster Analysis. | | | |
| Unit III: Artificial Intelligence | | | |
| State Space Search, Heuristic Search, Randomised Search, Finding Optimal Paths, Problem Decomposition, Planning, Game Playing, Constraint Satisfaction Problems, Knowledge based Reasoning, Logic and Inferences, Structured knowledge representations, Natural Language Processing, Reasoning under uncertainty. | | | |
| Unit IV: Machine Learning Techniques | | | |
| Naïve Bayesian classifiers, Inferences in Bayesian Networks, hidden Markov Models, Concept Learning, Decision Trees, K-Means clustering algorithm, Learning from outcomes, Artificial Neural Networks, Reinforcement Learning. | | | |
| Unit V: Deep Learning | | | |
| Feed forward Neural networks - Gradient descent - Back propagation algorithm - Activation Functions - ReLU Heuristics for avoiding bad local minima - Regularization. CNN building blocks – common architecture – Training Pattern - LSTM - GRU - Encoder Decoder architectures – LeNet – miniVGGNet – learning rate scheduler - Spotting under fitting and over fitting – Architecture visualization. Auto encoders (standard, sparse, de noising, contractive), Applications of Deep Belief Nets, RNN, Generative Adversarial Networks | | | |
| Unit VI: Application Trends | | | |

Character/ handwriting Recognition - Image Compression, visualizing an image, Image Augmentation, image captioning, Language Modelling- Satellite image processing, Recommendations systems, Classification using Convolutional Neural Networks - Dialogue Generation with LSTMs, NLP and Vector Space Model of Semantics,

References

- [1] Noreen Burlingame and Lars Nielsen, "A Simple Introduction to Data Science", 2012.
- [2] Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data", The McGraw-Hill Companies, 2012.
- [3] Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
- [4] Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, LLC, 2014.
- [5] Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4 th edition, Academic Press; 2009.
- [6] Machine learning by Tom M. Mitchell, McGraw Hill 1997
- [7] Neural Networks: A systematic Introduction, Raul Rojas, 1996
- [8] Pattern Recognition and Machine Learning, Christopher Bishop, 2007
- [9] Dr. Adrian Rosebrook "Deep learning for computer vision with python". Starter Bundle, IST Edition.2017.
- [10] Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016

| Advanced System Architecture and Software | | | |
|---|-------------------------------|--------------------------|--|
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| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: | | | |
| Data-Level Parallelism in vector, SIMD, and GPU Architectures: Introduction, Vector Architecture, SIMD Instructions Set Extensions for Multimedia, Graphics Processing Units, Detecting and Enhancing Loop-level Parallelism, Crosscutting Issues, Mobile versus Server GPUs and Tesla versus Core i7, Fallacies and Pitfalls, Case Study | | | |
| Unit II: | | | |
| Thread-Level Parallelism: Introduction, Centralized Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors, Distributed Shared-Memory and Directory-Based Coherence, Models of Memory Consistency Multicore Processors and Their Performance, Vector Processors Why Vector Processors? Basic Vector Architecture, Two Real-World Issues: Vector Length and Stride, Enhancing Vector Performance, Effectiveness of Compiler Vectorization | | | |
| Unit III: | | | |
| Hardware and Software for VLIW and EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically, Detecting and Enhancing Loop-Level Parallelism, Scheduling and Structuring Code for Parallelism, Hardware Support for Exposing Parallelism: Predicated Instructions, Hardware Support for Compiler Speculation, The Intel IA-64 Architecture and Itanium Processor | | | |
| Unit IV: | | | |
| Introduction to Operating System and Process Management: Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Pre-emptive, non-pre-emptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls. | | | |
| Unit V: | | | |
| Concurrency control Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill | | | |
| Unit VI: | | | |
| Memory Management Memory Management requirements, Multi-Processor Based and Virtualization Concepts Virtual machines; hypervisor. Basics of Network Operating System, Server Operating System, and Real Time Operating System | | | |

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| References |
| [1] Hennessey and Patterson: “Computer Architecture a Quantitative Approach”, 5th Edition, Elsevier, 2013. [2] Kai Hwang: Advanced Computer Architecture - Parallelism, Scalability, Programmability, 2nd Edition, Tata McGraw Hill, [3] Operating System Concepts, 9th [4] Abraham Silber Schatz, John Wiley & Sons, Inc. [5] Modern Operating Systems -By Andrew S. Tanenbaum (PHI) [6] Operating Systems 5th Edition, William Stallings, Pearson Education India. |

| Modern Networking | | | |
|---|-------------------------------|--------------------------|--|
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| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Modern Networking | | | |
| Networking Ecosystem, Network Architectures, Global Network Architectures, Typical network Hierarchy, Ethernet: Application, Standards and data rates, Wi-Fi, 4G and 5G Cellular, Cloud Networking, Internet of things – Evolution, Layers of IoT, Network Convergence, Types of networks and Internet Traffic, Elastic and Inelastic traffic, real time traffic characteristics, QoS and QoE requirements, Routing, Congestion Control. | | | |
| Unit II: Software Defined Networks | | | |
| Evolving network requirements, SDN Approach – Requirements and architecture, Characteristics, SDN related standards, SDN Data Plane: Data Plane functions, protocols. OpenFlow logical network Device – Flow table structure, flow table pipeline, OpenFlow protocol. SDN Control Plane: Functions, Interfaces, Routing, ITU-T Model, Open Daylight, REST, Cooperation and coordination among Controllers, SDN Application Plane: Architecture, Abstraction layers, Traffic, Security | | | |
| Unit III: Network Virtualisation | | | |
| Network Functions Virtualisation Concepts, Virtual machines, NFV Benefits and requirements, NFV Reference architectures, NFV Functionality – Infrastructure, Virtualised network functions, NFV management and Orchestration, NFV use cases, Virtual LANs, Virtual private Networks, Software Defined Infrastructure. | | | |
| Unit IV: Cloud Computing and Internet of Things | | | |
| Cloud Platform Architecture over Virtualized Data Centers, Cloud Computing and Service Models, Services and Service- Oriented Architecture, Message-Oriented Middle-ware, Portals and Science Gateways, Discovery, Registries, Metadata and Databases, Work-flow in Service-Oriented Architectures, Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. IoT Architecture – M2M high-level ETSI architecture, IETF architecture for IoT – OGC architecture, IoT reference models, IoT protocol – M2M and WSN protocols – SCADA, RFID, IEEE 802.15.4 – BACNet protocol – Zigbee, Modbus, 6LowPAN, CoAP, security. | | | |
| Unit V: Wireless Networks | | | |
| 3G and 4G networks, UMTS, UTRAN, Cellular Networks, LTE, Control Plane and User Plane, WiMAX, Wireless Sensor Network, Adhoc and Heterogenous networks, VLC and Li-Fi networks, VLC Modulation schemes. | | | |
| | | | |

Unit VI: Security

Mathematical Foundation - Probability and Information Theory - Algebraic Foundations – Number Theory. Confidentiality Modes of Operation – Key Channel Establishment For Symmetric Cryptosystems, Encryption – Symmetric Techniques, Asymmetric Techniques And Data Techniques, Authentication, Information System Threats and attacks, Classification of Threats and Assessing Damages 18 Security in Mobile and Wireless Computing,

References

- [1] Stallings, W. (2015). Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud. United Kingdom: Pearson Education.
- [2] Distributed and Cloud Computing- Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra – Elsevier-2012
- [3] Cloud Computing – A Hands-on Approach – Arshdeep Bahga, Vijay Madiseti – University Press2014
- [4] Enterprise Cloud Computing – Gautam Shroff – Cambridge University Press – 2014.
- [5] Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
- [6] Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
- [7] Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
- [8] Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.
- [9] Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
- [10] Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
- [11] C.Siva Ram Murthy and B.S.Manoj, Adhoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education.
- [12] Pei Zheng and Lionel M Li, „Smart Phone & Next Generation Mobile Computing“, Morgan Kaufmann Publishers, 2006.
- [13] Charles E. Perkins, Ad hoc Networking, Addison – Wesley
- [14] Wireless Sensor networks: Feng Zhao, Leonidas Guibas –Morgan Kaufmann Publications – 2012.
- [15] Fundamentals of Wireless sensor networks Theory and Practice – Walteneus Dargie, Christian Poellabauer – Wiley – 2010
- [16] Principles of LED Light Communications: Towards Networked Li-Fi, Svilen Dimitrov, Harald Haas

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BV00/IMED/6871201-22

Date: 29th October 2021

To,


Shri G. Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune


Subject: Syllabus for PhD Course on Research and Publication Ethics

Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.

Your's sincerely,


Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.


Sr. Shashank Joshi
Dean Faculty of Engineering


Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|--|---------|
| 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement and enforcement of Copyright and Patents | |
| Practical RPE 04: Open Access Publishing: 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | 4 hours |
| RPE 05: Publication Misconduct: A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review process B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools. | 4 hours |
| RPE 06: Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | 7 hours |

References:

- Bird, A. (2006) Philosophy of Science. Routledge.
- MacIntyre, Alasdair (1967) A Short History of Ethics. London.
- P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
- National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
- Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
- Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
- <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

**Bharati Vidyapeeth
Deemed to be University,
College of Engineering Pune**

Ref. no. BVDUCOE/Elect./133/2021-22

Date : 15/12/2021

Subject: Minutes of Meeting of Board of Studies in Electrical Engineering

A meeting of the members of Board of studies in Electrical Engineering was held (online) on 13/12/2021 at Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune at 11.00 AM.

The following members of the board were present

- | | | |
|-----------------------|---|----------|
| 1. Dr. D.S. Bankar | : | Chairman |
| 2. Dr. R.M. Holmukhe | : | Member |
| 3. Mr. S. A. Namekar | : | Member |
| 4. Mrs. R. S. Ambekar | : | Member |
| 5. Mr. V.V. Mhetre | : | Member |

Mr. Y. B. Mandake were remained absent with prior permission.

The following points were discussed in the meeting,

1. Confirmation of minutes of previous meeting.

Resolution : The minutes of previous BoS meeting conducted on 13/09/2021 were read and confirmed.

2. Approval of CET syllabus of Ph.D. Entrance examination.

Resolution : The aspects of curriculum revision was discussed along with its salient features. Accordingly, the proposed syllabus of Ph.D. Entrance examination (CET) was discussed in detail along with the suggestions received from the experts and approved the same.

The proposed syllabus of Ph.D. Entrance examination (CET) is attached in annexure I.

3. Approval of structure and syllabus of Pre Ph.D. Coursework

Resolution : The aspects of revision of structure and syllabus of Pre Ph.D. Coursework was discussed along with its salient features. Accordingly, the proposed structure and syllabus of Pre Ph.D. Coursework was discussed in detail along with the suggestions received from the experts and approved the same.

The proposed syllabus of Ph.D. Entrance examination (CET) is attached in annexure I.

4. Change of UG programme nomenclature from B.Tech Electrical Engineering to B.Tech Electrical and Computer Engineering.

Resolution : On the basis of prevailing market demand and students perceptions; it is felt that the present nomenclature of B.Tech (Electrical Engineering) should be changed to B.Tech (B.Tech Electrical and Computer Engineering).

Being today's need with reference to job opportunities available, curriculum of Electrical Engineering should have notable Software and Information Technology related contents. It is felt that this will attract the students for admission. This nomenclature will give a sense of development of students for software industries without loosing the core contents of Electrical Engineering. Hence graduate of B.Tech Electrical and Computer Engineering will have core knowledge of Electrical Engineering and Software Engineering too.

B.Tech Electrical and Computer Engineering. programme will focuses on core Electrical Engineering courses in power systems, control systems, electrical machines, power electronics, drives and protection and courses such as modeling, simulation, data analysis for designing and developing software and hardware for industrial needs from computer engineering field. This will create an Electrical Engineering with knowledge of software development related to Electrical Engineering.

The proposed nomenclature is listed in the AICTE handbook, necessary communication will be initiated with AICTE from the institute in due course of time.

Therefore, the proposed nomenclature of B.Tech Electrical and Computer Engineering. have been approved after detailed discussion.

The meeting was concluded with the vote of thanks proposed by the chair.

Prof. Dr. D. S. Bankar
Chairman Board of Studies
Electrical Engineering
Bharati Vidyapeeth (Deemed to be) University, Pune.

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering & Technology

BoS : Electrical Engineering

PhD Common Entrance Test Syllabus

1. Electrical machines and Drives

Single-phase transformer: equivalent circuit, phasor diagram, regulation and efficiency; Three-phase transformers: parallel operation; DC machines: types, characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, equivalent circuit, starting and speed control; single-phase induction motors; Synchronous machines: types, performance and characteristics, regulation and parallel operation of synchronous generator, starting of synchronous motors.

DC motor characteristics, Chopper fed DC drive, Multi-quadrant DC drive, Closed-loop control of DC Drive, Induction motor characteristics, Scalar control or constant V/f control of induction motor, Control of slip ring induction motor

2. Power electronics

Simple diode circuits, Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications. Combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters, Boolean algebra, Sequential Logic, and Its Applications: Storage elements: latches & flip flops, Shift Registers, Ripple Counters, Synchronous Counters. Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

3. Network Theory, Control systems and Microcontrollers

Network Theorems: KCL, KVL, Node and Mesh analysis, star-delta transformation; Superposition, Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations: Initial conditions – Classical method and Laplace transforms methods of solutions. Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method, resonance, two port networks, balanced three phase circuits, complex power and power factor in ac circuits

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems. Introduction to 8051 Microcontrollers Architecture, Features, Pin layout, addressing modes, accessing memory using various addressing modes. Introduction

to PIC Microcontroller, CPU registers, Pin diagram, Instruction pipelining, CPU registers, Addressing modes. Application of PIC Microcontrollers.

4. Measurement, Instrumentation and power system protection

Errors in Measurement & Measurement standards, Measurement of Resistance, Inductance and Capacitance, AC bridges for inductance and capacitance measurement. Electronic Measurements: Electronic instruments: Voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Storage oscilloscope, Spectrum & Wave analyzer, Digital counter, frequency meter, and Digital Voltmeter. *Instrumentation*: Transducers & sensors, classification & selection of sensors, Measurement physical quantities,

Requirement of a circuit breakers, difference between an isolator and circuit breaker, principle of operation of a circuit breaker, Various terms, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers, SF6 breakers, vacuum circuit breakers, lightning arrestor. Non-directional and directional over current relays, IDMT and Directional characteristics, Differential relay, Buchholz relay, Merz price protection. Transformer protection scheme and Transmission line protection, protection of generators and transmission lines.

5. Power system analysis and power quality

Power generation by renewable & non-renewable energy sources. transmission, and distribution. Element of AC distribution, types, Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance. Models of short, medium and long transmission lines, skin, proximity, and Ferranti effect. Classification of cables, insulation resistance, grading of cables. Per unit system, Reactance Diagram, Formation of Y-bus and Z-bus, Load flow problem, power flow equations, load flow solution using Gauss Seidal and Newton Raphson methods, Symmetrical fault, unbalanced faults (Single line to ground fault, Line to line and double line to ground), Concepts of types of stability limits, steady state stability analysis, transient stability analysis, Swing equation and its solution by point-by-point method, Equal area criterion, critical clearing angle and improvement of transient stability.

Power quality terms, Power Quality evaluation procedure, Importance of Power Quality, Symptoms of poor power quality, Power quality terms- its sources, effects and mitigation techniques, Power quality measuring devices, its selection, International standards related to power quality, power quality monitoring.

Annexure - 2
Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering & Technology

BoS : Electrical Engineering

Pre-PhD Course Work- Structure and Syllabi

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Electrical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 08 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

| BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY) | | |
|---|--|-------------------------|
| FACULTY OF ENGINEERING AND TECHNOLOGY | | |
| Ph.D. Course-work Syllabus | | |
| Paper-I | | |
| Research Methodology | | |
| Teaching Scheme | Examination Scheme | Credits Allotted |
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |
| Topics Covered | | |
| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> | (8 Hours) |

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| | <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor. Research Ethics: ethical issues in research, plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |
| Assignments: | | |
| 1. | Identify and write the research gap areas based on the literature review. | |
| 2. | Use Mendeley or similar software and list the references in a report. | |
| 3. | Define a research problem and mention the scope and objectives of your research topic. | |
| 4. | Determine the limitations and assumptions of the identified research problem. | |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 6. | Develop a research report based on your research area. | |
| 7. | Prepare effective power point presentation based on your research report. | |
| 8. | Present your research topic to the research committee. | |
| 9. | Design a review paper based on literature review carried out by you. | |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma, Operational Research, Kedar Nath Ram Nath & Co., 1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

Paper-II

Programme Specific Course: Electrical Engineering

Elective – 1 (Application of Power Electronics in Power System)

| Application of Power Electronics in Power System | | |
|---|---|---------------------------------|
| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Pre-requisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, power system, electrical machines, power electronics | |
| Course Objectives: | | |
| 1. | To analyse strong foundation for further study of power electronic circuits and systems | |
| 2. | To examine the HVDC converters and their control system. | |
| 3. | Assess the performance parameters of various types of inverters, analyse and compare different PWM techniques for their control | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Design and examine power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application domains. | |
| 2. | Discuss the principle of operation and model and simulate the advanced converters such as of multi-level converters, PWM rectifiers & Matrix converter | |
| 3. | Formulate and analyse a system-level power electronic design, then evaluate its performance. | |
| 4. | Develop the capacity to design an electrical power system with adequate safety devices while increasing the efficiency of the transmission and distribution system using environmentally friendly technology. | |
| 5. | Assess the various methods of control and compensation to determine the best option for minimising social and environmental problems and recognise the need to keep up with technological developments and integrate them into the current system to improve efficiency, flexibility, and quality of operation. | |
| UNIT I | Power Electronics devices, circuits and applications | (08 Hours) |
| | Survey of power semiconductor devices: Power diode, SCR, BJT, MOSFET, IGBT, Switching characteristics, driver circuits, protection, cooling, application. | |

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| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations | |
| UNIT II | Converters | (08 Hours) |
| | <p>AC-DC converter: Single phase Semi & Full converters for R, R-L loads, PWM</p> <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modelling of DC-DC converters, Power Factor Correction Circuit Design of Switching-Mode Power Supply (SMPS)</p> <p>DC-AC inverter: Single-phase, three-phase, Multilevel inverters, Matrix inverter</p> <p>Harmonics Elimination/Modulation Techniques</p> | |
| UNIT III | Advanced Processors for Power Converters | (08 Hours) |
| | <p>Arm processor architecture and pipelining –programmer’s model – data paths and instruction decoding –ARM instruction set – addressing modes – General Purpose Input and Output (GPIO) - Analog to Digital Converter – Digital to Analog Converter – Simple programming</p> <p>Timers and PWM: Different modes of operation of Timers - Match Registers – Generation of PWM using Compare registers - Capture Control – Single and Double Edge Controlled PWM – programming</p> | |
| UNIT IV | Power System Operations and Quality standards | (08 hours) |
| | <p>Power system operation, Monitoring and Scenario Analysis, Power System Optimization, Power system stability</p> <p>Power quality: issues and mitigation techniques, power quality monitoring standards: IEEE 1159 and IEC 61000 series standards, distributed generation and power quality</p> | |
| UNIT V | Solid State Power Controllers-I | (08 Hours) |
| | <p>FACTS CONCEPTS: Electrical Transmission Network – Necessity – Power Flow in AC System – Power Flow and Dynamic stability considerations of a transmission interconnection – relative importance of controllable parameter – opportunities for FACTS – possible benefits for FACTS Technology – FACTS Controllers – Types, brief description and definitions</p> <p>STATIC VAR COMPENSATION: Need for compensation – introduction to shunt and series compensation – objectives of shunt and series compensation – configuration and operating characteristics</p> | |
| UNIT VI | Solid State Power Controllers-II | (08 Hours) |

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| | <p>SERIES COMPENSATORS: Commutation in DC motors, difference between mechanical and electronic Commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square – Wave permanent magnet brushless motor drives, torque and EMF equation, torque – speed characteristics of Permanent Magnet Brush less DC Motors – controllers PM DC Motor</p> <p>STATIC VOLTAGE AND PHASE ANGLE REGULATORS: Objectives of voltage and phase angle regulators – approaches to Thyristor – Controlled Voltage and Phase Angle Regulator</p> | |
| Continuous Assessment | | |
| <p>The assessment work shall consist of following:</p> <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. N. Mohan et.al. "Power Electronics- Converters, Applications and Design", John Wiley & Sons (Asia) Private Ltd., Singapore, 1996. | | |
| 2. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 3. Andrew N.Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide Designing and Optimizing System Software” Morgan Kaufmann Publishers, 2011 | | |
| 4. Narain G. Hingorani and Laszlo Gyugyi, “Understanding FACTS – Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers, New Delhi, 2001. | | |
| 5. R. Mohan Mathur and Rajiv K. Varma, “Thyristor Based FACTS Controller for Electrical Transmission Systems”, Wiley Interscience Publications, 2002 | | |
| 6. G.T. Heydt, Power Quality, Stars in a Circle Publications, Indiana, 1991. | | |
| 7. T.J.E. Miller, Static Reactive Power Compensation, John Wiley & Sons, New York, 1982. | | |
| 8. Cyril W Lander, Power Electronics, McGraw-Hill International Editions, 1993 | | |

Elective – 2 (Power System and Power Quality)

| Power System and Power Quality | | |
|---|---|---------------------------------|
| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Power systems, Electrical Machines, Power Electronics | |
| Course Objectives: | | |
| 1. | To analyse aspects of power electronic circuits and systems. | |
| 2. | To understand the importance of flexible AC transmission systems and controllers. | |
| 3. | To introduce basic concepts of load and drive interaction, speed control concepts of ac and dc drives, speed reversal, regenerative braking aspects, design methodology. | |
| 4. | To analyse the steady state and dynamic state operation of dc machine and induction machine through mathematical modelling. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Design and evaluate converter circuits and learn to select suitable power electronic devices by assessing the requirements of application domains. | |
| 2. | Apply the concept of reactive power control to AC power system | |
| 3. | Demonstrate the mathematical modelling of electrical machines. | |
| 4. | Analyse and design protection schemes to provide protection for the HVDC transmission against over currents and over voltages | |
| 5. | Analyze the important Power Quality Terms and its related standards | |
| 6. | Analyze various methods of power quality monitoring and management and study the measuring equipment's. | |
| UNIT I | Power Electronics devices and its applications | (08 Hours) |
| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations AC-DC converter: Single phase Semi & Full converters for R, R-L loads, PWM | |

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| | <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modelling of DC-DC converters, Power Factor Correction Circuit Design of Switch Mode Power Supply (SMPS)</p> <p>DC-AC Converter: Single-phase, three-phase, Multilevel inverters, Modulation Techniques</p> | |
| UNIT II | Power System Compensation techniques | (08 Hours) |
| | <p>Transmission Lines, SVC and Loads: Transmission Lines, D-Q Transformation using alpha and beta Variables, Static VAR compensators. UPFC, STATCOM</p> <p>Power system operation, Monitoring and Scenario Analysis, Power System Optimization, FACTS, HVDC, Compensator, Power system stability, Role and design of Capacitor banks, design of FACT devices.</p> | |
| UNIT III | Electrical Machine Modeling and Analysis | (08 Hours) |
| | <p>Modeling of machines: Induction motor theory, Machine modeling, Park's Transformation, Synchronous rotating frame, Reference frame and modeling.</p> <p>Dynamic Modeling of Three Phase Induction Machine: Generalized model in arbitrary frame, electromagnetic torque, derivation of commonly used induction motor models-stator reference frames model, rotor reference frames model, synchronously rotating reference frames model, equations in flux linkages, per unit model, dynamic simulation.</p> | |
| UNIT IV | High Voltage DC Transmission | (08 hours) |
| | <p>INTRODUCTION: Introduction to AC and DC Transmission – application of DC Transmission – description of DC transmission – DC system components and their functions – modern trends in DC Transmission. HVDC Topology.</p> <p>PROTECTION: Basics of protection – DC reactors – voltage and current oscillations – circuit breakers – over voltage protection – switching surges – lightning surges – lightning arresters for DC systems.</p> | |
| UNIT V | Power Quality Issues | (08 Hours) |
| | <p>INTRODUCTION: Power Quality phenomena – Basic terminologies – various events in Power Quality – Causes for reduction in Power Quality — Power Quality Standards</p> <p>VOLTAGE SAG: Causes of voltage sags – magnitude and duration of voltage sags – effect on adjustable AC Drives, DC drives, computers and consumer electronics – monitoring and mitigation of voltage sags. Low voltage ride through capability.</p> | |

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| UNIT VI | Power quality mitigation and Measurement Techniques | (08 Hours) |
| | <p>HARMONICS: Fundamentals of harmonics, applied harmonics, power quality monitoring standards: IEEE 1159 and IEC 61000 series standards, Power Quality Evaluation procedure. Origin of harmonics – effect of harmonics on adjustable speed ac drives – harmonic reduction using PWM and harmonic injection. Harmonic filter selection criteria, distributed generation and power quality. Procedure for Harmonic filter design.</p> <p>MEASUREMENTS: Interpretation and analysis of Power Quality. Power Quality measuring devices, Selection process for measuring devices, Importance of Test Location and Test duration. Power Quality safety considerations.</p> | |
| <u>Continuous Assessment</u> | | |
| The assessment work shall consist of following: | | |
| <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. N. Mohan et.al. "Power Electronics- Converters, Applications and Design", John Wiley & Sons (Asia) Private Ltd., Singapore, 1996. | | |
| 2. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 3. Math. H. J. Bollen, "Understanding Power Quality Problems – Voltage Sags and Interruptions", IEEE Press, 2000 | | |
| 4. David D. Shipp and William S. Vilcheck, "Power Quality and Line Considerations for Variable Speed AC Drives", IEEE Transactions on Industry Applications, Vol. 32, March / April – 1996 | | |
| 5. Hideaki Fujita and Hirofumi Akagi, "The Unified Power Quality Conditioner: The Integration of Series and Shunt Active Filters", IEEE Transactions on Power Electronics, Vol. 13, No. 2, March 1998 | | |
| 6. Christopher J. Melhorn and Mark. F. McGranaghan, "Interpretation and Analysis of Power Quality Measurements", Electrotek Concepts, Inc. 1998 | | |
| 7. Harmonic Distortion in the electric supply system", – Technical Note No. 3 from Integral Energy Power Quality Centre, University of Wollongong, March 2000 | | |
| 8. Electrical Power Systems Quality- R C Dugan, Tata McGraw Hill publications | | |

Elective – 3 (Advances in Renewable Energy Systems)

| Advances in Renewable Energy Systems | | |
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| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS</u> |
| | | <u>ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, Laplace Transform, Test signals, differential equation solution | |
| Course Objectives: | | |
| 1. | Understand the need of energy conversion and the various methods of energy storage | |
| 2. | To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems. | |
| 3. | Illustrate the concepts of direct energy conversion systems & their applications. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | To analyse strong foundation for further study of power electronic circuits and systems | |
| 2. | To examine the energy efficient technologies for electrical systems. | |
| 3. | Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation | |
| 4. | Explore the concepts involved in wind energy conversion system by studying its components, types and performance. | |
| 5. | Demonstrate the generation of electricity from various non-Conventional sources of energy, have a working knowledge on types of fuel cells | |
| 6. | Examine the applications of optimization techniques for renewable energy systems. | |
| UNIT I | Power Electronics for Renewable Energy Systems | (08 Hours) |
| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations | |

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|-----------------|--|-------------------|
| | <p>AC-DC Converter: Single phase Semi & Full converters for R, R-L loads, PWM</p> <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modeling of DC-DC converters, Power Factor Correction Circuit Design of Switching-Mode Power Supply (SMPS)</p> <p>DC-AC Converter: Single-phase, three-phase, Multilevel inverters Harmonics Elimination/Modulation Techniques</p> | |
| UNIT II | Energy Efficient Methodologies in Electrical Systems | (08 Hours) |
| | <p>Energy monitor of Electrical system: Power supply, Electricity billing, Electrical load management and maximum demand control, Power factor improvement and its benefit, Selection and location of capacitors, Performance assessment of PF capacitors, Distribution and transformer losses. Electric motors: Types, characteristics, losses, efficiency, selection, energy efficient motors, Factors affecting motor performance, Rewinding and motor replacement issues. Energy saving opportunities with Pumps, cooling towers, fans and blowers.</p> <p>Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, soft starters with energy saver, Variable speed drives, Energy efficient transformers, electronic ballast, Occupancy sensors, Energy efficient lighting controls.</p> | |
| UNIT III | Solar Energy Systems | (8 Hours) |
| | <p>Solar Energy: – Solar radiation and measurement – Solar cells and their characteristics – Influence of insulation and temperature – PV arrays – MPPT, Electrical storage with batteries – Solar availability in India – Switching devices for solar energy conversion – Standalone inverters – Charge controllers – Water pumping – Audio visual equipment’s, Street lighting, Analysis of PV systems. Grid connection issues: islanding, storage, protection issues, power and voltage fluctuations, harmonics.</p> | |
| UNIT IV | Wind Energy Systems | (08 hours) |
| | <p>Wind Energy Conversion System: – Power in the wind – components of a wind energy conversion system – Performance of various Generators for WECS – Classification of WECS. LVRT, Modeling of WECS, Grid codes.</p> | |
| UNIT V | Fuel Cells & Its Application | 0(8 Hours) |
| | <p>Fuel cells for automotive applications, technology advances in fuel cell vehicle systems, onboard hydrogen storage, liquid hydrogen and compressed hydrogen, fuel cell control system, alkaline fuel cell, road map to market. Membraneless Microfluidic Fuel Cell.</p> | |

| UNIT VI | Integrated systems | (08 Hours) |
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| | Wind / Solar PV integrated systems – selection of power conversion ratio – Optimization of system components – Storage. Modeling of different renewable Integrated systems, Microgrids. Various major software tools required for design, analyze, and optimization of hybrid system: HOMER, RET Screen, PVsyst, iHOGA. Roll of Storage devices in integration of renewable energy sources with the grid. | |
| Continuous assessment: | | |
| The assessment work shall consist of following: <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 2. Albert: Plant Engineers & Managers Guide to Energy Conservation | | |
| 3. Wayhe C.Tuner : Energy Management Handbook | | |
| 4. Books of Energy Management & Auditors, Bureau of Energy Efficiency, (A Statutory body under Ministry of Power, Government of India), www.bee-india.nic.in volume I,II,III & I | | |
| 5. Rai G.D., “Non – Conventional Energy Sources”, Khanna Publishers, 1993. | | |
| 6. Rai G.D., “Solar Energy Utilisation”, Khanna Publishers, 1993. | | |
| 7. Daniel, Hunt V, “Wind Power – A Handbook of WECS”, Van Nostrend Co., New York, 1981. | | |
| 8. Gary L. Johnson, “Wind Energy Systems”, Prentice Hall Inc., 1985. | | |
| 9. Freris L. L., “Wind Energy Conversion”, Prentice Hall (UK) Ltd., 1990 | | |
| 10. Hybrid-Renewable Energy Systems in Microgrids, Integration, Developments and Control, 1st Edition - June 2, 2018, This is the Latest Edition, Editors: Hina Fathima, Prabakaran N, Palanisamy K, Akhtar Kalam, Saad Mekhilef, Jackson Justo. eBook ISBN: 9780081024942 | | |
| 11. Integration of Renewable and Distributed Energy Resources in Power Systems, Tomás Gómez San Román and José Pablo Chaves Ávila, ISBN 978-3-03943-487-9 (Hbk); ISBN 978-3-03943-488-6 (PDF), https://doi.org/10.3390/books978-3-03943-488-6 | | |

| Control and Automation | | |
|---|--|--------------------------|
| EXAMINATION SCHEME: | | CREDITS ALLOTTED: |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, Laplace Transform, control systems | |
| Course Objectives: | | |
| 1. | To provide with basic knowledge of state space representation of control systems, non-linear system analysis, associated terminologies. | |
| 2. | To understand the concepts of optimal and robust control, to enable to analyse and design a robust Control System. | |
| 3. | To apply soft computing techniques for control system applications. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Master Lyapunov's stability theory and its modern control theoretic extensions. Know how to investigate stability for linear systems with static, sector-contained non-linearities. | |
| 2. | Analyse and design a robust control system. | |
| 3. | Analysis, design & implementation of SISO & MIMO systems using state space approach. | |
| 4. | Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution. | |
| 5. | Identify and formulate the needs of different types of controllers and compensator to ascertain the required dynamic response from the system. | |
| 6. | Define and explain the basic properties of multivariable linear systems such as controllability, observability, and transfer functions. | |
| UNIT I | Modeling and Analysis of LTI Systems | (08 Hours) |
| | Modeling of physical Systems. Design specifications and performance indices, Transportation lags. Approximation of time-delay functions. Sensitivity of control systems to parameter variations. Effects of disturbance of signals. Disturbance rejection. Analysis in state-space: A perspective on state-space design. State variables. State models for physical systems. SISO and MIMO systems. Solution of state equations. Transfer function. Eigenvalues and eigenvectors. Jacobian linearization technique. State transformations and diagonalization. Transformation to phase-variable canonical form. Controllability and observability. | |
| UNIT II | Feedback control design | (08 Hours) |

| | | |
|---|---|-------------------|
| | PID controller tuning rules. Two degrees of freedom control systems. Compensator design using Bode diagram in frequency response approach. Lag, Lead, Lag-lead compensator. Control law design for full state feedback by pole placement. Full order observer system. Observer based state feedback. | |
| UNIT III | Optimal and Robust Control | (08 Hours) |
| | Robust Control: Parametric uncertainty and Kharitnov's method for stability test. Stability function, complementary sensitivity function and return difference. Effect of high frequency plant uncertainty. Optimal Control: Linear optimal control with quadratic performance index, Stochastic optimal linear estimation & control. | |
| UNIT IV | Non-Linear Control systems | (08 hours) |
| | Nonlinear system: Classification and types of non-linearity. Phenomena peculiar to non-linear systems. Methods of analysis. Linearization based on Taylor's series expansion. Jacobian Linearization. Phase trajectory and its construction. Phase-plane analysis of linear and non-linear systems. Existence of limit cycles. Describing function of typical non-linearities. Stability analysis by DF method. Introduction to DIDF. Popov's circle criterion. Stability analysis by Lyapunov's indirect and direct methods, Lyapunov's theorem. | |
| UNIT V | Discrete-time Systems | (08 Hours) |
| | Introduction to Discrete-time Systems: Basic elements of discrete-time control system. Z-transform and properties. Inverse Z-transform. Difference equation and its solution by Z-transform method. Z-transfer function. | |
| UNIT VI | Soft computing techniques | (08 Hours) |
| | Fuzzy logic, Artificial Intelligence, Neural Networks, Deep Learning, Machine Learning | |
| Continuous assessment | | |
| The assessment work shall consist of following: <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. Ogata, K – Modern Control Engineering, PHI Learning | | |
| 2. Kuo, B.C. – Automation Control Systems, Prentice Hall | | |
| 3. Roy Choudhury, D – Modern Control Engineering, Prentice Hall | | |
| 4. Nagrath, J. J. Gopal, M – Control System Engineering, New Age Pub. | | |
| 5. Schulz, D.G. and Melsa, L. – State Functions and Linear Control Systems, McGraw-Hill. | | |
| 6. Stepheni, Shahian, Savant, Hostetler – Design of feedback control systems, Oxford University Press. | | |
| 7. Vidyasagar- Nonlinear system analysis, Prentice-Hall | | |

8. Gopal. M, Modern Control System Theory, New Age International.

9. Gopal. M, Digital Control and State Variable Methods, TMH.

10. Kaushik Kumar, Supriyo Roy, J. Paulo Davim: Soft Computing Techniques for Engineering Optimization, CRC Press

| Paper-III Literature Survey and Presentation | |
|--|-------------------------------------|
| <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Term Work: 100 Marks | Total: 04 |
| <p>Candidate may follow the guidelines mentioned below for completing the requirements of this course.</p> <ul style="list-style-type: none"> • Internal Assessment (Credits: 2) Synopsis Submission (Including Introduction, Literature Review, Research approach/ Methodology, Conclusion) • External Assessment (Credits: 2) Presentation | |

Paper-IV
Research and Publication Ethics

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BV DU/IMED/687/2021-22

Date: 29th October 2021

To,

Shri G. Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune

Subject: Syllabus for PhD Course on Research and Publication Ethics

Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.

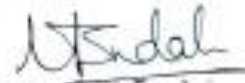
Your's sincerely,



Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.



Sr. Shashank Joshi
Dean Faculty of Engineering



Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework
Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019). ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Anok Kumar Singhvi : Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing, UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland. Springer International Publishing.

**BHARATI VIDYAPEETH
DEEMED TO BE UNIVERSITY
COLLEGE OF ENGINEERING, PUNE-43**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

Ref.No. BVDU/COE/ ECE / /2021-22

Date:17/12/2021

Minutes of meeting of the BOS

The Board of Studies meeting was conducted on 14-12-2021 at 11.A.M in offline mode.

The following members of the board were present:

1. Dr. R. B. Ghongade : Chairman
2. Dr. A. A. Shinde : Member
3. Dr. S. K. Oza : Member
4. Dr. N. T. Markad : Member
5. Dr. S. P. Gaikwad : Member
6. Dr. M. V. Patil : Member
7. Dr. V. H. Patil : Member

The following points were discussed in the meeting: -

1. Warm welcome was extended to all members by the Chairman, BOS.
2. Review of the last meeting was taken.
3. The final structure for PhD coursework for academic year 2022-23 was discussed.
4. The BOS members suggested to add prerequisites, objectives and assignments in each course.
5. The contents of each course were discussed in detail. The committee members requested to review and modify the course contents by including latest topics in VLSI Design, Electronics Communication and Signal & Image processing courses.
6. Revised course contents to be prepared on a priority basis by the respective faculty.
7. The following documents are to be submitted to Bhavan before 15th Jan 2022.
 - a. Equivalence between CBCS 2007 course & CBCS 2014 Course.
 - b. Equivalence between CBCS 2020 course & CBCS 2021 Course.



Dr. R. B Ghongade
Chairman, Board of Studies,
(Electronics & Communication Enng., Electronics & Telecommunication Engineering)
Bharati Vidyapeeth Deemed to be University, College of Engg. Pune.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Ph. D. Entrance Test Syllabus

Specific Subject:-Electronics Engineering

Topics covered

| | |
|-----------------|--|
| UNIT-I | Signals and Systems: Linear Algebra, Calculus, Differential Equations, Complex variables, Continuous and Discrete Time Systems, z-transforms, Continuous and Discrete time Fourier transforms, Continuous and Discrete time Fourier series, Random signal and noise. |
| UNIT-II | Analog and Digital Electronics: Diode Circuits, Basic BJT and FET circuits, Amplifiers, Op Amps, Integrated Circuits, Number System and Boolean Algebra, Combinational Logic Circuits, Sequential Circuits, Digital Systems. |
| UNIT-III | Network Theory and Control System: Circuit Theorems, RLC circuits, Solution of network equations using Laplace transform, Two port networks, Frequency response, Transfer functions, Stability, Time response, Frequency domain analysis, LTI control systems. |
| UNIT-IV | Micro controllers and Embedded system: Architecture of Micro controller, Memory organization, Interrupt structures for PIC microchip16F, 18F series. |
| UNIT-V | Analog and Digital Communication: Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, Fundamentals of AM/FM/PM, Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), Basics of TDMA, FDMA and CDMA and GSM. |

Text Books/References:

| | |
|-----|---|
| 1. | S K Mitra, Van Nostrand Reinhold, DSP: A computer- based approach, TMH |
| 2. | John G Proakis and Dimitris. G. Manolakis, Digital Signal Processing, Prentice Hall of India, 1997 |
| 3. | Duda R.O. and Hart P.E., John, Pattern Classification and Scene Analysis, Wiley Interscience, 1973. |
| 4. | R.C. Gonzalez and P. Wintz, Digital Image Processing, Addison Wesley, 2nd Ed, 1987 |
| 5. | Rosenfeld and A. C. Kak, Digital Image Processing Academic Press, Vol-1, 1982. |
| 6. | Douglass BP, Real time UML: Developing Efficient Objects for Embedded Systems, Addison Wesley, 2000 |
| 7. | A.S. Taanenbaum, Computer Networks, PHI/PEA, 4th Ed, 2003 |
| 8. | Douglas Comer, DL Stevens, Internetworking with TCP/IP, Vol III, PEA, 2nd Ed, 1996 . |
| 9. | Garg V, Joseph E. Wilkes, Wireless & Personal Communication Systems, Feher/Prentice Hall. |
| 10. | R. S. Khandpur, Handbook of Biomedical Instrumentation, McGraw Hills. |
| 11. | Timothy J Ross, Fuzzy logic with Engineering Applications, McGraw Hills, 1997. |

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|-----|---|
| 12. | Mehrotra, Mohan, Ranka, Elements of Artificial Neural Networks, MIT Press, 1997. |
| 13. | Munakata, Fundamentals of New Artificial Intelligence, Springer Verlag, 1998 |
| 14. | F.O Karray, CW DeSilva, Soft Computing & Intelligent Systems, Addison Wesley, 2005 |
| 15. | D. L. Perry, 'VHDL', Mc Graw Hill Inc., 1998. |
| 16. | Frank Vahid and Tony Givargis, "Embedded system design: unified hardware/software introduction", John Wiley & Sons, 2002. |
| 17. | Neil Weste, David Harris, "CMOS VLSI Design: A circuit and system perspective," 4th edition, Person Publication. |
| 18. | Myer Kutz, "Standard Handbook of Biomedical Engineering Design", MGH. |
| 19. | Webster, "Encyclopedia of Medical Devices and Instrumentation", Wiley Interscience |
| 20. | Andrew Sloss, Dominic Symes, Chris Wright, " ARM system developer's guide Designing and izing System software, Morgan Kaufmann Publishers, 2010. |
| 21. | Robert Ashby, "Designers guide to Cypress PSoC", Elsevier Publications. |
| 22. | Kaushik Roy, Sharat Prasad, Low Power CMOS VLSI Design., John Wiley and Sons. |
| 23. | Aswin Sreedhar, Sandip Kundu, Nanoscale CMOS VLSI Circuits Design for Manufacturability , MGH. |
| 24. | Erwin Kreyszig, Advanced Engineering Mathematics, Laurie Rosatone |
| 25. | Vijay Garg, Wireless communication and networking, Morgan Caufmann |
| 26. | William Stallings, Wireless Communications and Networks, PHI |
| 27. | B. V. Ramna, Higher Engineering, Tata McGraw Hills |

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Department of Electronics Engineering
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Electronics Engineering* | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | 02 | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 10 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

*Programme Specific Course: (Any one to be opted)

1. Artificial Intelligence & Machine Learning
2. Signal and Image Processing
3. Electronic Communication
4. VLSI

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

| Teaching Scheme | | Examination Scheme | | Credits Allotted | |
|------------------------|----------------|---------------------------|------------|-------------------------|------|
| Lectures | : 4 Hours/Week | End Semester Examination | :60 Marks | Theory | : 04 |
| Tutorial | : - Hours/Week | Internal Assessment | :40 Marks | Practical/ Oral | :- |
| Total | : 4 Hours/Week | Total | :100 Marks | Total Credits | : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | PRELIMINARY MATHEMATICS Vectors and Matrices, Quadratic Forms and Definite Matrices, Time-Varying and Gradient Vectors, Jacobian and Hessian Matrices, Solution of Optimization Problems, Stability of Nonlinear Dynamical Systems, Analytic Geometry in Euclidean Space in Cartesian Coordinates ,Set Theory, Operation on sets | (8 Hours) |
| UNIT-II | ARTIFICIAL NEURAL NETWORKS-I Biological neuron , Artificial neuron model, concept of bias and threshold, Mc Culloch-Pits Neuron Model , implementation of logical AND, OR, XOR functions ,Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary , bipolar (linear, signum, log sigmoid, tan-sigmoid) ,Learning mechanisms: Hebbian, Delta Rule, Perceptron and its limitations, Multilayer perceptron (MLP) and backpropagation algorithm, Application of MLP for classification and regression | (8 Hours) |
| UNIT-III | ARTIFICIAL NEURAL NETWORKS-II Self-organizing Feature Maps, k-means clustering ,Learning vector quantization , Radial Basis Function networks: Cover's theorem, mapping functions(Gaussian, Multi-quadrics, Inverse multi-quadrics, Application of RBFN for classification and regression, Hopfield network, associative memories, Boltzmann machine | (8 Hours) |
| UNIT-IV | DEEP LEARNING Concept of deep neural networks, Convolutional Neural Networks (CNNs),Long Short Term Memory Networks (LSTMs),Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs) | (8 Hours) |
| UNIT-V | GENETIC ALGORITHMS Concept of genetic evolution, parent, child, chromosome, mutation from biological perspective, Comparison of Biological and GA Terminology , Robustness ,Non-integer Unknowns, Multi-parameter Problems, Mutation, Selection, Elitism ,Crossover, Initialization, Advanced Operators: Combinatorial Optimization, Locating Alternative Solutions using Niches and Species Constraints ,Multi-criteria Optimization Hybrid Algorithms, Alternative Selection Methods, Alternative Crossover Methods ,Considerations of Speed | (8 Hours) |

| | | |
|---|--|------------------|
| UNIT-VI | SUPPORT VECTOR MACHINES Concept of maximum margin classifiers and support vectors, Risk Minimization Principles and the Concept of Uniform Convergence ,The VC Dimension, Structural Risk Minimization ,Support Vector Machine Algorithms ,Linear Maximal Margin Classifier for Linearly Separable Data ,Linear Soft Margin Classifier for Overlapping Classes, The Nonlinear Classifier ,Proximal Support Vector Machines , Support vector machines for regression and classification | (8 Hours) |
| Assignments: (Using MATLAB or Equivalent software) | | |
| 1. | Implement logic gates using Culloch-Pits Neuron Model | |
| 2. | Implement perceptron network for emulating the behaviour of AND , OR logic gates | |
| 3. | Implement backpropagation algorithm for emulating XOR gate | |
| 4. | Implement MLP for two class classification | |
| 5. | Implement MLP for regression | |
| 6. | Implement k-means clustering algorithm | |
| 7. | Implement RBFN for two class classification | |
| 8. | Implement RBFN for regression | |
| 9. | Mini-project based on genetic algorithm | |
| 10. | Mini-project based on deep learning networks | |
| Text Books/References: | | |
| 1. | Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991 | |
| 2. | Neural Networks-A comprehensive foundation, Simon Haykin, Prentice Hall International Inc.,1999 | |
| 3. | Learning and Soft Computing-Support Vector Machines, Neural Networks, and Fuzzy Logic Models, Vojislav Kecman, The MIT Press,2001 | |
| 4. | Genetic Algorithms in Search, Optimization, and Machine Learning, David Goldberg, Addison Wesley, 1989 | |
| 5. | Pattern Classification, Peter E. Hart, David G. Stork Richard O. Duda, Second Edition , 2000 | |
| 6. | Deep Learning for Dummies, John Paul Mueller (Author), Luca Massaron, Wiley ,2019 | |
| 7. | Introduction to Deep Learning, Eugene Charnaik, MIT Press, 2018 | |
| 8. | Machine Learning for Dummies, John Paul Mueller (Author), Luca Massaron, Wiley ,2018 | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Sub: Bio-Signal and Image Processing**

| Teaching Scheme | | Examination Scheme | | Credits Allotted | |
|------------------------|----------------|---------------------------|------------|-------------------------|------|
| Lectures | : 4 Hours/Week | End Semester Examination | :60 Marks | Theory | : 04 |
| Tutorial | : - Hours/Week | Internal Assessment | :40 Marks | Practical/ Oral | :- |
| Total | : 4 Hours/Week | Total | :100 Marks | Total Credits | : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | Introduction to Signal Processing A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Circular Correlation – Filtering methods based on DFT – FFT Algorithm, z-transform, Filtering, various transforms, System design and Implementation issues, Introduction to Discrete Cosine Transform , DSP architectures | (8 Hours) |
| UNIT-II | Digital Speech Processing Fundamentals of Digital Speech Processing, Time Domain Models for Speech Processing, Spectral Analysis of Speech: Formant Frequency, Fundamental Frequency, Synthesis of Pole-Zero Speech Models, Linear Prediction of speech signal analysis. Speech Enhancement: Speech enhancement techniques: Single Microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multimicrophone Approach, Automatic speech recognition and synthesis techniques, Speaker recognition algorithms, trade-offs and implementation issues. | (8 Hours) |
| UNIT-III | Digital Imaging Basic steps of Image Processing System Sampling and Quantization of an image, Image Transforms: 2 D- Discrete Fourier Transform, Wavelet Transform. Sensor array processing and imaging: ambiguity function, range-Doppler radar, reconstruction of signals from projections, tomography, synthetic aperture radar, radio astronomy, beam forming sonar. | (8 Hours) |
| UNIT-IV | Image Enhancement Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing, spatial filters, Sharpening spatial filters, Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering, Image segmentation, Evaluation issues in segmentation: Supervised & Unsupervised evaluation, Applications. | (8 Hours) |
| UNIT-V | Image Compression Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, Arithmetic coding, LZW coding, Run length coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, JPEG Standards, Image restoration. | (8 Hours) |

| | | |
|-------------------------------|--|------------------|
| UNIT-VI | Fundamentals of Biomedical Sensing Bioelectric phenomena - Origin of bio-potentials - Biopotential measurements – ECG, EEG, EMG, ERG, ENG - Chemical biosensors – electrochemical sensors and chemical fibro-sensors - Fundamentals of light propagation in biological tissue – Biophysical measurement techniques using light – photoplethysmography – Acoustic biosensors – phonocardiography - Photoacoustic bio-signals – estimation of blood glucose. | (8 Hours) |
| Assignments: | | |
| 1. | Identify the research areas in speech Processing and Image Processing. | |
| 2. | Study of automatic speaker identification systems. | |
| 3. | Study of speech enhancement techniques. | |
| 4. | Image sharpening using high pass filter in frequency domain. | |
| 5. | Study of Histogram of image and Histogram equalization. | |
| 6. | Explore Image Enhancement using Spatial Domain filter. | |
| 7. | Image Compression Coding Technology. | |
| 8. | Study of Image segmentation techniques. | |
| 9. | Study of color image processing. | |
| 10. | Study of Computed Tomography. | |
| 11. | Study of any biosensing device. | |
| Text Books/References: | | |
| 1. | Digital processing of speech signals – L. R. Rabiner and S.W. Schafer, Pearson Education. | |
| 2. | Douglas O’Shaughnessy, Speech Communications: Human & Machine, IEEE Press. | |
| 3. | Gonzalez and Woods, Digital Image Processing, Pearson. | |
| 4. | A K Jain, Fundamentals of Digital Image Processing, Pearson 2004. | |
| 5. | S. Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, Tata McGraw Hill, 2011. | |
| 6. | Myer Kutz, Standard Handbook of Biomedical Engineering Design, MGH. | |
| 7. | R. Begg, D.T.H. Lai, M. Palaniswami, “Computational Intelligence in Biomedical Engineering”, CRC Press, 2008. | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Electronics Communication Engineering**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral : |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | Microwave and Antenna Microwave components, amplifier design, plane waves at a media interface, waveguides, dielectric wave guide, radiation, arrays, propagation of radio waves, microwave antenna, antenna measurement, open ranges, Anechoic chamber, compact ranges, near field and far field measurements, computational electromagnetic methods. | (8 Hours) |
| UNIT-II | Mixed Signal Analysis Signal integrity, techniques, equivalent models, characteristics, limitations, mixed signal processing, simulation, physical parameters. Modelling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various applications. | (8 Hours) |
| UNIT-III | Wireless & Broadband Communication IEEE/ITU/ ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae, and frontend design issues, Performance issues, Network architectures, Security algorithms with their performance measures. | (8 Hours) |
| UNIT-IV | RF Systems RF amplifier, mixer and local oscillator designs, Advanced filter designs, amplifiers, Transmission line design, Design challenges in satellite frequency bands, characteristics, mathematical models, power relations, stability considerations, stability circles, unconditional stability stabilization methods & designs. | (8 Hours) |
| UNIT-V | Wireless Communication and Networks Computer simulation of radio channels, Overview of 4G-LTE networks, IP switching and MPLS- Overview of IP over ATM and its evolution to IP switching, State of art of OFDM and MIMO, Optical communication networks- DWDM based network, Optical network on chip, Introduction to near field communication, LoRa communication | (8 Hours) |

| | | |
|------------------------------|--|------------------|
| UNIT-VI | Coding and Modulation Techniques in Communication Digital communication system architectures, Source coding, Channel coding, Performance measures of communication systems, PLD based system implementations and related issues. | (8 Hours) |
| Textbooks/References: | | |
| 1 | William Stallings, Wireless Communications and Networks, PHI | |
| 2 | Theodore S. Rappaport, Wireless Communications: Principles and Practice, 2e 2002, Prentice Hall. | |
| 3 | Liao SY, Microwave Devices and Circuits, 1987, 2e, Prentice Hall of India | |
| 4 | Miligan TA, Modern Antenna Design, Jun 2005, 2e, McGraw Hill | |
| 5 | Jochen Schiller, Mobile Communication, 2e, PEA, 2003 | |
| 6 | Data and computer communications by william stallings | |
| 7 | Data Communication and Networking by Achyut Godbole | |
| 8 | Antennas and Wave Propagation by John Kraus and Ronald J. Marhefka and Ahmad S. Khan | |
| 9 | Antennas Wave Propagation by U A Bakshi | |
| 10 | Simon Haykin, Michael Moher, An Introduction to Analog and Digital Communications, 2nd Edition, Wiley Publications | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II
VLSI Design**

| Teaching Scheme | | Examination Scheme | | Credits Allotted | |
|------------------------|----------------|---------------------------|------------|-------------------------|------|
| Lectures | : 4 Hours/Week | End Semester Examination | :60 Marks | Theory | : 04 |
| Tutorial | : - Hours/Week | Internal Assessment | :40 Marks | Practical/ Oral | :- |
| Total | : 4 Hours/Week | Total | :100 Marks | Total Credits | : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | Digital VLSI Design CMOS Inverters, Inverter Design with Delay constraints, Combinational CMOS Logic Circuit, CMOS TG, Sequential CMOS Logic Circuit, Dynamic Logic circuit | (8 Hours) |
| UNIT-II | Analog VLSI Design MOS Subcircuits: MOS Switch, MOS Diode, Current Sinks and Sources, Current Mirrors, References, Basic CMOS Amplifier: Inverting, Differential and Cascode, CMOS OP AMP Design | (8 Hours) |
| UNIT-III | Mixed mode VLSI Design Comparator Specifications, OP AMP as a Comparator, Latched Comparator, Data Converter Specifications, Overview of Nyquist rate Data Converter, Oversampling Data Converters | (8 Hours) |
| UNIT-IV | Low Power CMOS VLSI Design Overview of Power Consumption, Low Power Techniques: at Device Level, Circuit Level, Logic level and Architecture Level | (8 Hours) |
| UNIT-V | High Speed VLSI Design Impact of Scaling, Modeling and Optimization of VLSI Interconnect, Complementary GaAs Technology for High-Speed VLSI Circuits, Current mode Techniques for High-Speed VLSI Circuits | (8 Hours) |
| UNIT-VI | Deep submicron VLSI Design Deep Submicron CMOS transistor theory, Deep Submicron CMOS Circuit Fabrication, Silicon-on-Insulator Technology, Single-Electron Transistors, Carbon Nanotubes, Quantum Dots, Spintronics | (8 Hours) |

Reference books:

1. Principles of CMOS VLSI Design : A Systems Perspective by N H E Weste and K Eshraghian
2. CMOS Circuit Design, Layout and Simulation by R Jacob Baker and H.W.Li
3. Analog and Mixed Mode Vlsi Design by Gejji Vineeta P. PHI Publications

| | |
|----|---|
| 4. | Low-Power Digital VLSI Design: Circuits and Systems Paperback by by Abdellatif Bellaouar, Mohamed Elmasry |
| 5. | VLSI Physical Design From Graph Partitioning to Timing Closure by Andrew B. Kahng, Jens Lienig, Igor L. Markov, Jin Hu , Springer |
| 6. | |
| 7. | |
| 8. | |
| 9. | |



Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Chancellor

Prof. Dr. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor

Bharati Vidyapeeth
(Deemed to be University)
Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

- ★ Accredited with 'A' Grade (2017) by NAAC ★
- ★ Category-I University Status by UGC ★
- ★ NIRF Ranking - 63 ★

"Social Transformation Through Dynamic Education"



Dr. Vishwajeet Kadam
B.Tech., M.T.A., Ph.D.
Pro Vice Chancellor
G. Jayakumar
M.Phil., Ph.D.
Registrar

NOTICE OF MEETING

A meeting of the Board of Studies in Mechanical and Production Engineering will be held 29th March 2022 at 11.00 a.m. in the BVDU's College of Engineering, Pune - Satara Rd, Pune - 43.

You are requested to make it convenient to attend the meeting.

The agenda of the meeting is given below.

Ref. No. BVDU/AIS/487/2021-2022

Date : March 23, 2022

G. Jayakumar
REGISTRAR

Note.- Prior permission is necessary for travel by Car.

Agenda

1. Confirmation of minutes of the previous meeting.
2. Restructuring the structure of course 2020 for B.Tech. Mechanical Engineering and B.Tech. Robotics Automation.
3. Syllabus of Ph.D. Nanotechnology.
4. Any other item with permission of the chair.

To,

1. Dr. S. S. Chavan Chairman,
Professor, College of Engineering, Pune - 43.
2. Dr. P. V. Jadhav Professor, College of Engineering, Pune - 43.
3. Dr. K. B. Sutar Associate Professor, College of Engineering, Pune - 43.
4. Dr. V. K. Kurkate Associate Professor, College of Engineering, Pune - 43.
5. Dr. D. B. Jadhav Assistant Professor, College of Engineering, Pune - 43.
6. Mr. U. S. Pawar Assistant Professor, College of Engineering, Pune - 43.
7. Mr. Digambar Parkale General Manager M/S. Century Enka, Pune.
8. Dr. Ratnakar Ghorpade Professor, MIT WPU, Kothrud, Pune - 38.

Bharati Vidyapeeth
(Deemed to be University) Pune
Board of Studies in Mechanical, Production and Robotics & Automation Engineering

A meeting of Board of Studies in Mechanical & Production Engineering was arranged on 29th March, 2022 at Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune.
Following faculty members

| Sr. No. | Name of Faculty/ Expert | Designation | Organization |
|---------|-------------------------|---------------|---------------------------------------|
| 1 | Dr. S. S. Chavan | Chairman | BVDUCOE, Pune |
| 2 | Dr. K. B. Sutar | Member | BVDUCOE, Pune |
| 3 | Dr. P.V. Jadhav | Member | BVDUCOE, Pune |
| 5 | Dr. D. B. Jadhav | Member | BVDUCOE, Pune |
| 6 | Prof. U. S. Pawar | Member | BVDUCOE, Pune |
| 7. | Dr.R.R. Ghorpade | Co-opt Member | Professor MIT WPU Kothrud Pune |
| 8. | Mr. Digambar Parkale | Co-opt Member | General Manager M/S Century Enka Pune |

Minutes of Meeting

Welcome to all members of BoS Mechanical & Production Engineering

Resolution

- Dr. Sachin Chavan Chairman welcome all BOS member and two newly co-opt members Dr. R. R. Ghorpade, Mr. Digambar Parkale for meeting of academic year.

Agenda

Confirmation of minutes of previous meeting.

Resolution

It was resolved that the minutes of previous meeting held on 22nd Sept. 2021 be confirmed.

Amendments in the course structure of CBCS 2020 course for B. Tech. Mechanical Engineering and B. Tech. Robotics & Automation.

Resolution

Amendments were done as per the requirements of student and faculty members. Details are mentioned in Annexure 01.

Syllabus of Course work Ph. D. Nanotechnology.

Resolution

Course work Syllabus for course specific was prepared and approved. Details in Annexure 02

Any other item with permission of the chair

**Eligibility for Ph. D. Nanotechnology
Resolution**

He was recommend by all the members that eligibility for Ph.D Nanotechnology must be M.Tech (All Branches) and M.Sc (All Branches)

Annexure I

With reference to the above subject, we in the department of Mechanical Engineering are facing following administrative difficulties in implementation of CBCS 2020 Course curriculum for the two programmes viz. B. Tech. Mechanical, B. Tech. Robotics & Automation:

1. Student had experienced too much load per semester and by faculty to administer the same. Therefore, it was decided to reduce credits from 230 to 200 in the new curriculum course structure
2. Difficulty in Implementation of 'MOOC courses' as compulsory part of the course structure, as completion of MOOC course by all the students in respective semesters is very difficult. So three MOOC courses are being keep as optional course with 02 credits each, total 04 credits.
3. Maintaining the quality of teaching by the industry experts while teaching Industry taught and vocational courses
4. Difficulty in conducting Project-I Stage-I and Project-I Stage-II in sem. V and VI respectively as the students will not be getting sufficient knowledge to perform these activities in these semesters. So only Project Stage I and II are been kept in Sem. VII and VIII.
5. Difficulty in Implementation of 'social activities' and 'Writing of a research paper' as compulsory part of the course structure as it is difficult to maintain the records of the students of same. So two social activities and research paper writing are being keep as optional with 02 credits each, total 06 credits.
6. Difficulty in conducting Internship in Sem. VI. The practical period after Sem V is insufficient for completion of internship, therefore internship must be shifted to Sem VII.

The new course structure is attached herewith.

Annexure II

Structure the syllabus as per directives of UGC for Ph.D (Nanotechnology) Pre-Ph.D Course Work

Resolution:

1. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|---------|----------------------|------------------------------|---|----------------------------|----|-------|-------|---------|---|-------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |

| | | | | | | | | | | |
|--------------|---|-----------|-----------|------------|-----------|------------|------------|-----------|-----------|-----------|
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

Research Methodology: The following Research Methodology syllabus was revised and approved by members

| | | |
|---|---|---------------------------------|
| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
| Paper-I Research Methodology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> • begin to formulate researchable problem in areas of research interest; • write an effective research proposal or report; • make appropriate choices about research strategies; • review literature judiciously and systematically; • understand and begin to apply the principles of collecting research data; • understand and begin to conduct appropriate analyses of data; • make appropriate choices about quantitative methods; • demonstrate sensitivity to ethical issues raised by researchers; | | |
| Topics Covered | | |
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |

| | | |
|-----------------|---|------------------|
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |

Assignments:

| | |
|----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |

| | |
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| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| Text Books/References: | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

02.Program Specific Course: Nanotechnology

Credits:04

| | | |
|--|-------------------------------|--------------------------|
| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Nanotechnology Engineering | | |
| Subject: Nanotechnology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |

| | | |
|--------------------------|---|--------------------------|
| <p>UNIT – I</p> | <p>Basics of Nanoscience Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene’s and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties</p> | <p>(06 Hours)</p> |
| <p>UNIT – II</p> | <p>Synthesis of Nonmaterial’s Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation. Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method</p> | <p>(06 Hours)</p> |
| <p>UNIT - III</p> | <p>Nanomaterials characterization Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy</p> | <p>(06 Hours)</p> |
| <p>UNIT - IV</p> | <p>Sustainable Nanotechnology: Application of industrial ecology to nanotechnology, Fate of nanomaterials in environment, environmental life cycle of nano materials, environmental and health impacts of nano materials, toxicological threats, eco-toxicology, exposure to nano particles – biological damage, threat posed by nano materials to humans, environmental reconnaissance and surveillance. Corporate social responsibility for nanotechnology, Nano materials in future - implications.</p> | |
| <p>UNIT - V</p> | <p>Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | <p>(06 Hours)</p> |
| <p>UNIT - VI</p> | <p>Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student’s t-test method.</p> | <p>(06 Hours)</p> |

| Text Books/Reference Books: | |
|------------------------------------|---|
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 |
| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. |
| 5 | 5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films |
| 9 | Liu,Hand Book of Advanced Magnetic Materials (4 Vol.) |
| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced. The following syllabus is prepared and approved by members.

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
|--|---|--------------------------|
| Paper-IV | | |
| Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview: This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy: Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE) Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |

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|------------------------------------|---|-------------------|
| UNIT - III | RPE 03: Publication Ethics 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | RPE 04: Open Access Publishing 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | (08 Hours) |
| UNIT - V | RPE 05: Publication Misconduct A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review proces B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools. | (08 Hours) |
| UNIT - VI | RPE 06: Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird, A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics. London. | |
| 3 | P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |
| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. | |

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|---|---|
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |

Course Structure and Syllabus for PhD in Mechanical Engg.

Structure the syllabus as per directives of UGC for Ph.D (Nanotechnology) Pre-Ph.D Course Work

Resolution:

1. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

1. Syllabus for PhD in Mechanical Engg.

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
|---|---|--------------------------|
| Paper-I Research Methodology | | |
| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> begin to formulate researchable problem in areas of research interest; write an effective research proposal or report; make appropriate choices about research strategies; review literature judiciously and systematically; understand and begin to apply the principles of collecting research data; understand and begin to conduct appropriate analyses of data; make appropriate choices about quantitative methods; demonstrate sensitivity to ethical issues raised by researchers; | | |

| Topics Covered | | |
|-----------------------|--|------------------|
| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work</p> | (8 Hours) |

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| | <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | |
| Assignments: | | |
| 12. | Identify and write the research gap areas based on the literature review. | |
| 13. | Use Mendeley or similar software and list the references in a report. | |
| 14. | Define a research problem and mention the scope and objectives of your research topic. | |
| 15. | Determine the limitations and assumptions of the identified research problem. | |
| 16. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 17. | Develop a research report based on your research area. | |
| 18. | Prepare effective power point presentation based on your research report. | |
| 19. | Present your research topic to the research committee. | |
| 20. | Design a review paper based on literature review carried out by you. | |
| 21. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 22. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma, Operational Research, Kedar Nath Ram Nath & Co., 1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
|---|---|---------------------------------|
| Paper-III Specific Subject: Mechanical Engineering Subject: Design Engineering | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3Hrs | |
| Topics covered | | |
| UNIT-I | Elasticity Components of stresses, Equations of Equilibrium, Specification of stress at a point. Stress invariants, Principal stresses and shear stresses and Mohr's diagram in three dimensions. Octahedral stresses, Decomposition of state of stress, Deformation, Strain Displacement relations, Strain components, State of strain at a point, Principal strain, Strain transformation, Compatibility equations, Generalized Hooke's law in terms of engineering constants | (08 Hours) |
| UNIT-II | Vibration Basic concepts, Free vibration of single degree of freedom systems with and without damping, forced vibration of single DOF-systems, Natural frequency., Transient Vibration of single Degree-of freedom systems, Impulse excitation, Arbitrary excitation, Laplace transform formulation, Pulse excitation and rise time, Shock response spectrum, Shock isolation vibration instruments, vibration exciters, transducers and measurement devices, analyzers. | (08 Hours) |
| UNIT-III | Computer Aided Design Geometric transformations-2D and 3D translation, scaling, rotation, shear and reflection Homogeneous transformations Types of mathematical representation of curves, Wire frame models wire frame entities Parametric representation of synthetic curves, Hermit cubic splines, Bezier curves. | (08 Hours) |

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| | Surface Modeling: Mathematical representation surfaces, Surface model, Surface entities surface representation Parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder. | |
| UNIT-IV | <p>Finite element Method</p> <p>Virtual energy principle, Rayleigh- Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain displacement relations.</p> <p>1-D structural problems – axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape function. Analysis of Trusses – Plane Truss and Space Truss elements.</p> <p>Analysis of beams – Hermite shape functions – stiffness matrix – Load vector – Problems 2-D problems –CST, LST, force terms, Stiffness matrix and load vector</p> | (08 Hours) |
| UNIT-V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate, and final. Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (08 Hours) |
| UNIT-VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (08 Hours) |

Text Books/References:

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|----|---|
| 1. | W. Strunk Jr., E.B. White, The Elements of Style, fourth ed., Longman, New York, 2000 |
| 2. | Anderson T. L, Fracture Mechanics-Fundamentals and Application CRC Press, 3rd Edition 2005. |
| 3. | Ralph Stephens, Ali Fatemi, Robert Stephens, Henry Fuchs Metal Fatigue in Engineering, John Wiley, Second edition. 2001 |
| 4. | L. S. Srinath Advanced Mechanics of Solids, Tata McGraw Hill, 2009. |
| 5. | W. T. Thomson , Theory of vibration with applications:- (PHI) |
| 6. | Ibrahim Zeid& R.Sivasubramanian, CAD/CAM Theory and Practice by, Tata Mc Graw Hill international. |
| 7. | Tirupathi K. Chandrupatla and Ashok D.Belegundu., Introduction to finite elements in engineering |

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| 8. | Nitin S. Gokhale, Sanjay S. Deshpande, Sanjeev V. Bedekar and Anand N. Thite, Practical Finite Element Analysis. Finite to Infinite, Pune. |
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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering Subject: Thermal Engineering | | |
| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3Hrs. | |
| Topics covered | | |
| UNIT-I | Computational Fluid Dynamics Dimensionless form of equations; Simplified mathematical models; Hyperbolic, Parabolic & Elliptic systems; Properties of numerical solutions (Consistency, Stability, Conservation, Convergence and Accuracy). Heat and Mass transfer Problems; Multi Phase Flows, laminar and turbulent flow modeling. | (08 Hours) |
| UNIT-II | Advanced Heat Transfer Overview of the subject of heat transfer with orientation to applications, Analytical solutions for temperature distribution, Problems related to anisotropic materials, Transient Conduction, Principle of Fluid flow and Convective heat transfer. Concept of velocity and thermal boundary layers, Navier-Stokes equations and convection equation, Boundary layer approximations and special conditions, Reynolds analogy, Chilton-Colburn analogy, mixed convection heat transfer. | (08 Hours) |
| UNIT-III | Introduction to Combustion Combustion Reactions, Enthalpy of formation. Entropy of formation, Reference levels of tables. Energy of formation, Heat of reaction, Adiabatic flame temperature generated product, Enthalpies, Equilibrium. Chemical equilibrium of ideal gases, Effect of non-reacting gases equilibrium in multiple reactions, The chemical potential and phase equilibrium. The Gibb's phase rule. | (08 Hours) |
| UNIT-IV | Renewable Energy Systems | (08 Hours) |

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| | <p>Introduction: Various non-conventional energy resources-Introduction, availability, classification, relative merits and demerits.</p> <p>Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.</p> <p>Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, solar thermal power plants, thermal energy storage for solar heating and cooling</p> <p>Principle of working of various types of fuel cells and their working, performance and limitations.</p> <p>Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors.</p> <p>Bio-mass: Availability of bio-mass and its conversion theory.</p> <p>Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.</p> <p>Wave and Tidal Wave: Principle of working, performance.</p> | |
| UNIT-V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate, and final. Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (08 Hours) |
| UNIT-VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (08 Hours) |
| Text Books/References: | | |
| 1. | Thermodynamics. Sonntag & Van Wylen. John Wiley & Sons | |
| 2. | Thermodynamics for Engineers/Doolittle-Messe / John Wiley & Sons | |
| 3. | Fundamentals of Heat and Mass Transfer-5thEd.Frank P. Incropera. John Wiley | |
| 4. | Heat Transfer. J.P Holman McGraw-Hill Book Company | |
| 5. | Fluid Mechanics. FM White. Boston: McGraw-Hill Book Company | |
| 6. | Boundary Layer Theory. Schlichting H. Springer Publications | |
| 7. | Computational Fluid Dynamics-The Basics with Applications. John D. Anderson, Jr., McGraw-Hill, Inc. New York. | |

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| 8. | Thermal System Design & Simulation. P. L. Dhar. Academic Press |
| 9. | Design & Simulation of Thermal Systems. N. V. Suryanarayana. McGraw-Hill. |
| 10. | Introduction to Combustion: Concepts & Applications. S. R. Turns. McGraw-hill. |
| 11. | Textbook of Renewable Energy. S. C. Bhatia, R. K. Gupta. Woodhead Publishing India PVT. Limited, 31-Jan-2019 |
| 12. | Introduction to Renewable Energy Technologies in India. Nasir UI, Rasheed Rather. Educreation Publishing (10 May 2018) |

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering Subject: Manufacturing Engineering | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3 Hrs. | |
| Topics covered | | |
| UNIT-I | Advanced Machining Processes General classification of unconventional machining processes; Abrasive jet machining, water jet and abrasive water jet machining, ultrasonic machining; Electric discharge machining and allied processes, laser beam machining, ion beam machining, plasma arc machining; Electro-chemical machining (ECM) and allied processes, ECM tool design, chemical machining, photochemical machining; Elastic emission machining; Advanced finishing processes, abrasive flow finishing, magnetic abrasive finishing, magneto rheological finishing, chemo-mechanical polishing; Comparative evaluation of different unconventional machining processes | (08 Hours) |
| UNIT-II | Computer Control of Manufacturing Processes Computers and CNC Architecture, Sensors and actuators, Logics and Programmable Logic Controllers, Discrete Control System Design, Motion Control Systems. Robotics and Robot Applications Definition and classification of ROBOTS and manipulators, motion and degrees of freedom, motion categories, uses, field of applications, Robot Arm Kinematics: Direct and Inverse, Robot arm dynamics, Manipulator trajectories, control of robot manipulators. Introduction to sensing and vision in robotics. | (08Hours) |

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| UNIT-III | Computer Integrated Manufacturing Evolution of Computer Integrated Manufacturing (CIM). Computer-Aided Design (CAD). Computer-Aided Manufacturing (CAM). CAD/CAM Integration. Review of automation and control technologies. Material Handling technologies. Data Communication technologies. Automatic Data Acquisition technologies. Database Management technologies. Various Manufacturing Systems: Group Technology & Cellular Manufacturing Systems, Flexible Manufacturing Systems, Transfer lines, Automated Assembly Systems. | (08 Hours) |
| UNIT-IV | Mechatronics and Manufacturing Automation Mechatronics in manufacturing, products and design. Review of fundamentals of electronics. Data conversion devices, sensors, micro sensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs. Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits. Pneumatic systems: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. | (08 Hours) |
| UNIT-V | Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology. | (08 Hours) |
| UNIT-VI | Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method. | (08 Hours) |

Text Books/References:

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| 1 | M. C. Shaw, Metal Cutting, Tata McGraw Hill, New Delhi, 2004. |
| 2 | M. C. Shaw, Principles of Abrasive Processing, Oxford University Press, 1996 |
| 3 | G. K. Lal, Introduction to Machining Science, New Age International Publishers, 2007. |
| 4 | G. Boothroyd and W. A. Knight, Fundamentals of Machining and Machine Tools, CRC-Taylor and Francis, 2006 |

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| 5 | K. S. Fu, R. C. Gonzalez and C.S.G. Lee, ROBOTICS: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987. |
| 6 | B. K. P. Horn, Robot Vision, MIT Press, Cambridge, 1986. |
| 7 | Y. Koren, Robotics for Engineers, McGraw Hill, 1985. |
| 8 | Groover, M. P., Automation production systems, and computer-integrated manufacturing, second edition, Prentice-Hall of India, New Delhi, 2001. |
| 9 | Vajpayee, S. K., Principles of computer-integrated manufacturing, Prentice-Hall of India, New Delhi, 2005. |
| 10 | Boucher, T. O., Computer automation in manufacturing: an Introduction, Chapman and Hall, 1996. |
| 11 | HMT Ltd. Mechatronics, Tata McGraw-Hill, New Delhi, 1988. |
| 12 | Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, 1994. |
| 13 | Boltan, W., Mechatronics: electronic control systems in mechanical and electrical engineering, Longman, Singapore, 1999. |
| 14 | Gary F. Benedict, Nontraditional Manufacturing Processes, Taylor & Francis, 1987. |
| 15 | P K Mishra, Non-Conventional Machining, Narosa India Publication, 1997. |
| 16 | Hassan El-Hofy, Advanced Machining Processes: Nontraditional and Hybrid Machining Processes, McGraw-Hill Prof Med/Tech, 2005. |
| 17 | P. C. Pandey and H. S. Shan, Modern Machining Processes, Tata McGraw-Hill Education, 1980. |
| 18 | James A. Brown, Modern Manufacturing Processes, Industrial Press, 1991. |
| 19 | J. A. McGeough, Micromachining of Engineering Materials, Taylor & Francis, 2001 |
| 20 | C. W. Ammen <i>The Complete Handbook of Sand Casting</i> . |

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY | | |
| FACULTY OF ENGINEERING AND TECHNOLOGY | | |
| Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering | | |
| Subject: Composite Material and Nanotechnology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |

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| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| UNIT - I | | |
| UNIT - II | <p>Basics of Nanoscience</p> <p>Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene's and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures - Fabrication, structure, electrical properties and mechanical properties</p> | (08 Hours) |
| UNIT - III | <p>Synthesis of Nonmaterial's</p> <p>Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation.</p> <p>Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method</p> | (08 Hours) |
| UNIT - IV | <p>Nanomaterials characterization</p> <p>Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy</p> | (08 Hours) |

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| UNIT - V | Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology. | (08 Hours) |
| UNIT - VI | Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 | |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 | |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 | |
| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. | |
| 5 | S.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 | |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling | |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials | |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films | |
| 9 | Liu, Hand Book of Advanced Magnetic Materials (4 Vol.) | |

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| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka, Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced.

The following syllabus is prepared and approved by members.

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-IV Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview:</p> <p>This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy:</p> <p>Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE)</p> <p>Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: | |

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| | <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | <p>RPE 02: Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |
| UNIT - III | <p>RPE 03: Publication Ethics</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | <p>RPE 04: Open Access Publishing</p> <ol style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU | (08 Hours) |

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| | 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | |
| UNIT - V | <p>RPE 05: Publication Misconduct</p> <p>A. Group Discussions (2 hrs.)</p> <ol style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals:examples and fraud from India and abroad 4. Peer review proces <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund,cross check, plagscan, Crossref and other open source software tools.</p> | (08 Hours) |
| UNIT - VI | <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases <p>B. Research Metrics (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird,A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics.London. | |
| 3 | P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |

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| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. |
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |

Course Structure and Syllabus for PhD in Nanotechnology

Structure for Ph.D (Nanotechnology) Pre-Ph.D Course Work

2. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

Syllabus for PhD Nanotechnology

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
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| Paper-I Research Methodology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> • begin to formulate researchable problem in areas of research interest; • write an effective research proposal or report; • make appropriate choices about research strategies; • review literature judiciously and systematically; • understand and begin to apply the principles of collecting research data; • understand and begin to conduct appropriate analyses of data; • make appropriate choices about quantitative methods; • demonstrate sensitivity to ethical issues raised by researchers; | | |
| Topics Covered | | |

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| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | Publishing of research work | (8 Hours) |

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| | <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | |
| Assignments: | | |
| 23. | Identify and write the research gap areas based on the literature review. | |
| 24. | Use Mendeley or similar software and list the references in a report. | |
| 25. | Define a research problem and mention the scope and objectives of your research topic. | |
| 26. | Determine the limitations and assumptions of the identified research problem. | |
| 27. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 28. | Develop a research report based on your research area. | |
| 29. | Prepare effective power point presentation based on your research report. | |
| 30. | Present your research topic to the research committee. | |
| 31. | Design a review paper based on literature review carried out by you. | |
| 32. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 33. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma, Operational Research, Kedar Nath Ram Nath & Co., 1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
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| Paper-III Specific Subject: Nanotechnology Engineering Subject: Nanotechnology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| UNIT – I | Basics of Nanoscience Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene's and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties | (06 Hours) |
| UNIT – II | Synthesis of Nonmaterial's Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation. Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method | (06 Hours) |

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| UNIT - III | <p>Nanomaterials characterization</p> <p>Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy</p> | (06 Hours) |
| UNIT - IV | <p>Sustainable Nanotechnology:</p> <p>Application of industrial ecology to nanotechnology, Fate of nanomaterials in environment, environmental life cycle of nano materials, environmental and health impacts of nano materials, toxicological threats, eco-toxicology, exposure to nano particles – biological damage, threat posed by nano materials to humans, environmental reconnaissance and surveillance. Corporate social responsibility for nanotechnology, Nano materials in future - implications.</p> | |
| UNIT - V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (06 Hours) |
| UNIT - VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (06 Hours) |
| Text Books/Reference Books: | | |
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 | |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 | |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 | |

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| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. |
| 5 | 5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films |
| 9 | Liu,Hand Book of Advanced Magnetic Materials (4 Vol.) |
| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced.

The following syllabus is prepared and approved by members.

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-IV Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview:</p> <p>This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy:</p> <p>Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE)</p> <p>Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: | |

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| | <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | <p>RPE 02: Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |
| UNIT - III | <p>RPE 03: Publication Ethics</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | <p>RPE 04: Open Access Publishing</p> <ol style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU | (08 Hours) |

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| | 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | |
| UNIT - V | <p>RPE 05: Publication Misconduct</p> <p>A. Group Discussions (2 hrs.)</p> <ol style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review process <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | (08 Hours) |
| UNIT - VI | <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases <p>B. Research Metrics (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird, A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics. London. | |
| 3 | P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |

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| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. |
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |




Bharati Vidyapeeth Deemed to be University

Faculty of Nursing

Ph.D Course work Syllabus

Revised Syllabus 2022-2023


Dr. (Mrs.) Nilima Rajan Bhoré
Dean, Faculty of Nsg. / Principal
BVDU, College of Nsg. Sangli.



Bharati Vidyapeeth

Founder Chancellor : Dr. Patangrao Kadam

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth (Deemed to be University) was established on 10th May 1964, by distinguished educationist Hon'ble Dr. Patangraoji Kadam, with a mission of promoting "Social Transformation Through Dynamic Education". Since its establishment, it has maintained the highest standards and has proliferated innovative practices in the education sector.

In the year 2013-14, Bharati Vidyapeeth celebrated the glorious Golden Jubilee year of imparting education and inculcating moral values among the youth. During the last 5 decades, Bharati Vidyapeeth has made astonishing strides in the field of education. Today it is one of the largest educational organizations in the country that imparts education right from the pre primary to the doctoral level. The spectrum of Bharati Vidyapeeth institutions of higher education spans all professional disciplines which include the colleges of Medicine, Dentistry, Nursing, Audiology, Optometry, Ayurved, Homeopathy, Engineering, Architecture, Management, Law, Pharmacy, Hotel Management and Catering Technology, Environment Education, Physical Education, Health Management, Biotechnology etc.



Research too is given a high priority in the university. To promote research activities and to create a research culture on its campuses, Bharati Vidyapeeth has established three self-financed specialized research institutes in the areas of Health Related Sciences, Pharmaceutical Science, and Social Sciences.

The colleges are affiliated to various universities including Bharati Vidyapeeth (Deemed to be University), University of Pune, University of Mumbai, Shivaji University Kolhapur and Indraprastha University, Delhi.

With an objective of making educational opportunities available to the deprived sections of the country, Bharati Vidyapeeth has established a large number of educational institutions in the rural areas. Bharati Vidyapeeth with a very moderate beginning in a short span of time has grown leaps and bounds having its major campuses in New Delhi, Navi Mumbai, Pune, Solapur, Kolhapur, Sangli, Karad, Satara and Panchgani.

Bharati Vidyapeeth (Deemed to be University) Pune, India

Bharati Vidyapeeth (Deemed to be University) came into existence in April, 1996, when the Ministry of Human Resource Development, Government of India, on the recommendations of UGC conferred the status of University on a cluster of 12 institutions of Bharati Vidyapeeth. In appreciation of the academic excellence achieved by the institutions through a committee of experts. Subsequent to that, the Government of India, vide its various notifications brought several other institutions of Bharati Vidyapeeth under the ambit of this University. As on today the University is having 29 constituent units conducting programmes in 12 different disciplines. Bharati Vidyapeeth (Deemed to be University) is one of the largest multi- faculty, multi-campus Deemed to be University in the country which has created a very laudable track record of academic achievements since its inception.

It offers a variety of programmes in 12 faculties namely:

1. Faculty of Medical Sciences
2. Faculty of Dentistry
3. Faculty of Ayurved
4. Faculty of Homoeopathy
5. Faculty of Nursing
6. Faculty of Engineering and Technology
7. Faculty of Pharmaceutical Sciences
8. Faculty of Management Studies
9. Faculty of Arts, Social Sciences and Commerce
10. Faculty of Sciences
11. Faculty of Law
12. Faculty of Interdisciplinary Studies

The twenty nine constituent institutions of the University are located in eight different campuses; two in Pune, and one each in New Delhi, Navi Mumbai, Kolhapur, Solapur, Sangli and Karad.

The UGC has also recognized this University u/s12(B) of UGC Act 1956. This University is a Member of Association of Indian Universities and has been a Member of Association of Common wealth Universities.





The University is academically and intellectually very productive. Its faculty members have a very remarkable track record of research publications and patents. It has digitalized the libraries in its constituent units and has been making an extensive use of modern Information and Communication Technology in teaching, learning, research and also administration. The University attracts students from all over India and around 35 countries due to its academic reputation.

Distinctive Features of Bharati Vidyapeeth (Deemed to be University)

- Accredited with 'A+' Grade by NAAC in 2017 for seven years.
- 'A' Grade University status by MHRD, Govt. of India
- Category-I (Deemed to be University Grade) by University Grants Commission
- Recognised under Section '12 B' of UGC Act (1956) by University Grants Commission
- Ranked 68th among top 100 Universities by NIRF 2021, MHRD, Govt. of India
- The University offers 250+ programmes under 12 faculties.
- High quality of all-around education has attracted many students from all over India and 35 countries to pursue their studies. Presently there are 23000+ students enrolled into various programmes offered by the University.
- Behind the reputation of the University are the solid credentials of accomplished and experienced 1700 + faculty members, imparting quality education.
- Excellent placements record for its students across faculties and has known industry endorsements.
- Strong alumni network spread across the globe.
- Programmes are designed to enhance employability of students with focus on collaborative and experiential learning pedagogy.
- Entrepreneurship cell has been established to develop entrepreneurial skill and incubate innovative business ideas.
- University constantly encourages and facilitates its faculties to be actively engaged in academic research and publications besides their teaching assignments by establishing collaborative and interdisciplinary research links with industries and institutions around the world.
- All professional programmes are approved by respective Statutory Councils.
- As part of dissemination of knowledge, University organizes International and National Conferences, Seminars, Workshops etc., in recent and upcoming themes.
- Knowledge Resource Centre (Libraries) has an excellent collection of books, print journals, e-journals, and magazines etc. which are regularly being expanded by adding latest publications.
- Augmented infrastructural facilities including smart classrooms, tools for blended learning, laboratories equipped with latest technologies, free accessibility to Wi-Fi, lush green campuses, adequate recreational facilities, on campus residential accommodation etc.
- University is committed to engage for the welfare of the society through various schemes of outreach Programmes and Field work.

Salient and Distinctive Features of Bharati Vidyapeeth (Deemed to be University)

This University:

- is one of the largest Deemed to be University in the country established u/s. 3 of the UGC Act, 1956;
- is a multi-faculty University offering a variety of courses in 12 faculties namely Faculty of Arts, Social Sciences and Commerce; Faculty of Science; Faculty of Law; Faculty of Medical Sciences; Faculty of Dentistry; Faculty of Ayurveda; Faculty of Homoeopathy; Faculty of Nursing; Faculty of Pharmaceutical Sciences; Faculty of Management Studies; Faculty of Engineering & Technology and Faculty of Interdisciplinary Studies is accredited and reaccredited by the NAAC with prestigious 'A+' grade. Category - I University Status by UGC.
- is probably the only University of its kind in the country having three self-financing Research Institutes devoted exclusively to the researches respectively in Health Related Sciences, Pharmaceutical Sciences and Social Sciences.
- has the distinction of getting recognition from the University Grants Commission u/s. 12 (B) of its act;
- is a University, which is academically and intellectually very productive. Its faculty members have a very laudable track record of research, publications and patents;
- has created a special fund to provide research seed money to its faculty members;
- has digitalized libraries of its constituent units and which makes an extensive use of modern Information and Communication Technology in teaching, learning and research and also in administration;
- publishes its own scientific Journal. Besides, two of its Management Education Institutes publish their own academic journals which have gained recognition in the core academic circles;
- has established linkages with more than 50 national and international reputed academic institutions, such as North Carolina A & T University (USA), University of Cologne, (Germany), Liverpool Law School, (UK), Kingston University (UK), Pioneer Research Centre for Nano-grid Materials, Pusan National University, Busan (South Korea), Deakin University (Australia), Salford University (Australia), Oxford Brookes University (UK) and several others;
- has several colleges of health related sciences such as Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Audiology & Speech Language Pathology, Optometry in one campus (Pune). This has facilitated introduction of interdisciplinary courses and research.



Constituent Units of Bharati Vidyapeeth (Deemed to be University)

Health Sciences:

1. Faculty of Medical Sciences

- Medical College, Pune
- School of Audiology and Speech Language Pathology, Pune
- School of Optometry, Pune
- Medical College and Hospital, Sangli
- School of Optometry, Sangli

2. Faculty of Dentistry

- Dental College and Hospital, Pune
- Dental College and Hospital, Sangli
- Dental College and Hospital, Navi Mumbai

3. Faculty of Ayurved

- College of Ayurved, Pune

4. Faculty of Homoeopathy

- Homoeopathic Medical College, Pune

5. Faculty of Nursing

- College of Nursing, Pune
- College of Nursing, Sangli
- College of Nursing, Navi Mumbai

Engineering & Technology

6. Faculty of Engineering and Technology

- College of Engineering, Pune
- College of Architecture, Pune

7. Faculty of Pharmaceutical Sciences

- Poona College of Pharmacy, Pune

Management

8. Faculty of Management Studies

- Institute of Management and Entrepreneurship Development, Pune
- Institute of Management and Research (BVIMR), Delhi

- Institute of Management, Kolhapur
- Institute of Management and Rural Development Administration, Sangli
- Yashwantrao Mohite Institute of Management, Karad
- Abhijit Kadam Institute of Management and Social Sciences, Solapur
- Institute of Hotel Management and Catering Technology, Pune
- Department of Management Studies (off-campus) Khargar, Navi Mumbai.

Social Sciences and Humanities

9. Faculty of Arts, Social Sciences and Commerce

- Yashwantrao Mohite College of Arts, Science and Commerce, Pune
- School of Performing Arts, Pune
- Social Sciences Centre, Pune
- College of Physical Education, Pune

10. Faculty of Sciences

- Rajiv Gandhi Institute of Information Technology and Biotechnology, Pune
- Institute of Environment Education and Research, Pune

11. Faculty of Law

- New Law College, Pune
- Bharati Vidyapeeth Department of Law, New Delhi

Faculty of Interdisciplinary Studies

12. Research Institutes:

- Interactive Research School for Health Affairs, Pune
- Yashwantrao Chavan Institute of Social Sciences Studies & Research, Pune
- Research and Development Centre in Pharmaceutical Sciences and Applied Chemistry

Rules and Regulations for Ph.D. Degree Programme (2022-23)

These rules and regulations regarding Ph.D. degree programme are framed in accordance with the UGC Regulations (Minimum standard and procedure for an award of Ph.D. degree), Regulation, 2016; published in the Gazette of India on 05th May, 2016.

1. ELIGIBILITY

The applicant shall have to fulfill one of the following conditions for an admission to a Ph.D. programme.

- 1.1. Candidates for admission to the Ph.D. programme shall have a Master's degree or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree from a foreign educational institution recognized under a law in its home country.
- 1.2. A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/ differently-abled and other categories of candidates as per the decision of the Commission from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark.
- 1.3.1 For Ph.D in Faculty of Medical Sciences, candidate should have Post Graduate Degree in Medical Sciences
- 1.3.2 The Candidates from Medical Sciences/ allied discipline may apply for Ph.D in Interdisciplinary studies
- 1.4. Candidates who have cleared the M.Phil. course work with at least 55% marks in aggregate or its equivalent grade in a point scale if a grading system is followed and have successfully completed the M.Phil. Degree shall be eligible to proceed to do research work leading to the Ph.D. degree in the same university in an integrated programme. The candidates possessing a degree considered equivalent to M.Phil degree of an Indian institution or from a foreign recognized institution, shall be eligible for Ph.D. programme.
- 1.5. A person whose M.Phil. dissertation has been evaluated and the viva voce is pending is also eligible for admission to the Ph.D. programme of the university, subject to the conditions mentioned above.
- 1.6. The candidates, who have UGC-NET (including JRF/AYUSH-NET) / UGC - CSIR NET (including JRF / SLET / valid GATE / GPAT / Project Fellows / Teacher fellowship or DST inspire fellowship, DBT fellowship, or Quality improvement programme (QIP), National Doctoral Fellowship Scheme (NDF) of AICTE or have passed M.Phil. will be exempted from appearing at the 'Written Entrance Test' for the Ph.D. admissions. However, these candidates will have to appear for Interview before the committee appointed by the University. These candidates should fill the form available online and pay registration fee of Rs. 1,500 /-.
- 1.7. The candidates appearing for the final year of the post-graduate examination can also appear for the Entrance Test. However, he/she will have to submit the result of qualifying examination at the time of interview, failing which his/her claim for admission, will get automatically cancelled.
- 1.8. 15% of seats over and above the total number of seats notified by the University in each subject are allocated to the Foreign / NRI / PIO candidates. Such candidates will have to appear for an interview before the Committee constituted by university authorities.

2. The Duration of the programme:

- 2.1. The Ph.D. programme shall be for a minimum duration of three years, including course work and a maximum of six years.
- 2.2. Extension beyond the above limit will be governed by the rules and regulations of the university.
- 2.3. The women candidates and persons with disability (more than 40% disability) may be allowed relaxation of two years for Ph.D. in the maximum duration.

3. Procedure for Admission

- 3.1. The admissions to a Ph.D. degree programme will be based on the merit obtained by the candidate in an 'All India Entrance Test' conducted by the University and fulfilment of the eligibility conditions.
- 3.2. The 'All India Entrance Test' will have 50% weightage for Research Methodology and 50% weightage for prescribed syllabus of respective subjects.
- 3.3. The written entrance test will be of 100 marks for duration of three hours. A candidate must score minimum 50% of marks (relaxation of 5% of marks from 50% to 45% for candidates belonging to SC/ST/differently abled category) in the test to qualify for the admission. Only those candidates who have scored 50% and more for the written test will be eligible to appear for the interview. (The written test will be at the designated centres mention in the brochure).
- 3.4. The written entrance test will be in English language only and consist of two sections: Section – I (First) will be on Research Methodology and will carry 50 marks. Section – II (Second) will be on the respective subject and will also carry 50 marks. Each section will carry seven questions and the candidate has to attempt any five of the given questions. The syllabus for both the sections is available on the university website.
- 3.5. In addition, the successful candidates have to appear for interview before a duly constituted departmental research committee which carries 50 marks where the candidate is required to present his/her research area/interest through presentation.
- 3.6. The candidate has to appear for the interview as a part of the admission process so as to prove the competence for the proposed research leading to new/additional knowledge in the area of respective subject.
- 3.7. The subject-wise final merit list of successful candidates will be notified on the university website within the stipulated time.
- 3.8. The candidates will be given admission to the Ph.D. degree programme according to their inter-merit based on the performance at the written entrance test and performance at the interview and the availability of the seats in the subject concerned. The exempted candidate will be evaluated based on their performance at the interview for 150 marks. Only a pre-determined number of seats, as mentioned in the information brochure, shall be admitted to Ph.D. degree programme in a given subject.
- 3.9. The candidate who has been declared as qualified for admission shall have to apply for the same in prescribed application form along with the prescribed fees and the following documents.
 - a) Authenticated copies of original statement of marks and degree certificates (Graduate, Post-graduate degree, M.Phil. NET / SLET etc.);
 - b) Migration/ Transference certificate;
 - c) Research Visa from a competent authority (for Foreign/NRI/PIO candidates).
- 3.10. The merit of the candidates scoring equal marks will be decided on the basis of marks obtained by them at P.G. degree examination.

- 3.11. The candidate must note that, mere registration on the website or appearance at the entrance test and inclusion of name in the merit list does not necessarily mean that he/she will get admission to the Ph.D. degree programme. The admission will be based on the pre-requisite qualifications as per the UGC (Minimum standard and procedures for award of Ph.D. degree) regulations, 2016.

4. Allocation of Research Supervisor/Guide:

- 4.1. The allocation of the research guide for a candidate selected for Ph.D. programme shall be decided by the departmental Research Committee appointed by the University in the concerned subject. The allocation of research Supervisor/guide will depend upon the availability of guides with the required specialization and the research interest of the candidate as indicated during interview process.
- 4.2. All other conditions of the Ph.D. programme will be in accordance with UGC (Minimum standard and procedures for award of Ph.D. degree) regulations, 2016.

5. Course Work

- 5.1 Credit requirements and minimum standards for Completion: The Course-work is a pre requisite for Ph.D. programme. The Pre-Ph.D coursework will comprise of 14 credits and span for a minimum duration of six months. Teaching pedagogy would be classroom teaching, moocs, seminars, presentations, etc. Mode of evaluation for courses will be University evaluation. The credits assigned to Ph.D. Course work shall be as follows with one credit being equivalent to 15 clock hours of teaching.

The Pre-Ph.D. Syllabus comprises of four papers as follows:

| | | | |
|------|--|---|------------|
| I. | Research Methodology | : | 4 credits |
| II. | Recent advances in the subject | : | 4 credits |
| III. | Presentations on proposed research work | : | 4 credits |
| | ((a) Presentations on review of literature | : | 2 Credits |
| | (b) Presentations on area of research | : | 2 Credits. |
| IV. | Research and Publications Ethics (RPE) | : | 2 credits |
| | | : | 14 Credits |

6. Research Work

- 6.1. After satisfactory completion of the course work, the student shall submit five copies of his/her Ph.D. research proposal to the University.
- 6.2. For each Ph.D. scholar there shall be Research Advisory committee appointed by the university with the concerned research supervisor of the scholar as the convener. The committee will review the research proposal and finalise the topic of research.

The research scholar shall appear before the Research Advisory Committee once in six months to make a presentation of the progress of his/her work for evaluation and further guidance. The six monthly progress reports shall be submitted by the Research Advisory Committee to the University with a copy to the research scholar.

- 6.3. The student will not be ordinarily allowed to submit his/her thesis before completion of the mandatory period from the date of his/her registration.

Please Note: If the PhD research scholar does not submit three (3) consecutive six monthly progress reports to BVDU, the PhD registration can be cancelled.

- 6.4. The student's registration for Ph.D. programme will be valid for a period of six years from the date of his/her provisional registration. If the student fails to submit his/her thesis within this period, an extension may be given as per the rule and regulations of the university on his/her request. If he/she fails to submit his/her thesis even within the extended period, his/her registration will stand cancelled and he/she will have to re-register for the course.
- 6.5. Change in Title of Thesis: The student will be permitted by the university to make minor changes in the title of his / her thesis on the recommendations of the Supervisor. However, such a change should not be such as would change the theme of research substantively. Such a change in the title will be allowed only once and that too only within one year prior to the submission of thesis to the University.

7. Requirements for submission of thesis:

A student will be allowed to submit the Ph.D. thesis to the University only if:

- 7.1. He/she has submitted, through his/ her guide, all six monthly progress reports to the University in time.
- 7.2. He/she has made presentations before the Research Advisory Committee, detailing the progress made in his/her research work.
- 7.3. He/she has published at least two research papers in a referred standard journals (at least UGC prescribed journals) based on his/her Ph.D. research and has presented two research paper in conferences / seminars and produces evidence for the same in the form of a reprint of the paper or at least a letter of acceptance.
- 7.4. The Ph.D. scholar has made a presentation before the concerned Research Advisory Committee based on a draft of the thesis and he/she has suitably incorporated the feedback and comments, if any, into the draft thesis.
- 7.5. While submitting the thesis the research scholar and the research supervisor shall submit a certificate attesting to the originality of the work and vouching that there is no plagiarism and that the work has not been submitted for the award of any other degree/diploma of this university or to any other institution. The facility for checking plagiarism is made available at the concerned research centre. The research scholar has to produce the certificate of the same and submit it along with the thesis to the university. The university will follow the UGC guideline regarding plagiarism
- 7.6. After fulfilling the above mentioned conditions, the Ph.D. scholar shall submit to the university, three hard copies along with soft copies of the thesis duly recommended and endorsed by his/her research supervisor. The copies should also include all the mandatory certificates and declarations.
- 7.7. The thesis should contain a declaration from the research scholar that the work presented in his/her thesis is an original work and has not been submitted earlier for an award of any degree or diploma. It should be clearly mentioned in the declaration that whatever material he/she has borrowed from other sources and incorporated in thesis has been duly acknowledged. It should be specifically mentioned in the declaration that the student will be held responsible and accountable for an evidence of plagiarism, if any, detected later on.
- 7.8. The open viva-voce examination of the research scholar to defend the thesis shall be conducted only if the evaluation reports of the external examiners on the thesis are satisfactory and include a specific recommendation for conducting the viva-voce examination. If the evaluation report of any one of the external examiners is unsatisfactory and does not recommend viva-voce, the university shall send the thesis to another external examiner out of the approved panel of examiners and the viva-voce examination shall be held only if the report of the latest examiner is satisfactory. The thesis shall be rejected and the research scholar shall be declared ineligible for the award of the degree, if the report of the latest examiner is also unsatisfactory.

Ph.D. Coursework Programme (Academic Year 2023-24)

Guidelines with respect to Structure, Teaching, Assessment and Declaration of Result

Structure of Ph.D. Coursework Programme:

- Total Number of Credits: 12 (12X15=180 hours)
- Total Number of Marks: 300 (150 marks of Internal Evaluation + 150 marks of University Examination) (IE:UE::50:50)

| Course | Credits | Syllabus | Assessment (Internal : University) | Internal Evaluation (Maximum Marks) | University Examination (Maximum Marks) |
|---|---------|--|--|---|--|
| Research Methodology | 4 | BVDU's Common Syllabus for all Faculties | 40:60 | 40 | 60 |
| Recent Advances in <Subject> | 4 | Subject Specific Syllabus | 40:60 | 40 | 60 |
| Presentations on Proposed Research Work | 2 | <syllabus is not required> | 100% internal | 50 | - |
| Research and Publication Ethics | 2 | UGC's Common Syllabus for all Faculties | 40:60 | 20 | 30 |

Conduction of Teaching:

To ensure uniformity in teaching process and to optimize the resources, the University formulated three groups to conduct the 12 credit (12X15=180 hours) Ph.D. Coursework Programme through hybrid mode (suggested mode: online on weekdays and offline on weekends)

| Group-1 | Group-2 | Group-3 |
|--|--|--|
| <ul style="list-style-type: none">Medical SciencesDentistryAyurvedHomoeopathyNursingInterdisciplinary Studies | <ul style="list-style-type: none">Arts, Social Science and CommerceLawManagement StudiesPharmaceutical SciencesScience | <ul style="list-style-type: none">Engineering and Technology |

Conduction of Assessment:

| Course | Credits | Syllabus | Internal Evaluation | University Examination (written descriptive) | | | |
|---|---------|--|---|---|-----------------------|---|---|
| | | | | Format of Question Paper | Duration | Assessment | Panel of Question Paper Setters |
| Research Methodology <ul style="list-style-type: none"> ▪ 40% Internal Assessment ▪ 60% University Examination | 4 | BVDU's Common Syllabus for all Faculties (syllabus designed by the committee appointed under the chairmanship of Prof. Dr. Sachin Vernekar) | Maximum Marks: 40 <ul style="list-style-type: none"> ▪ Class Participation: 10 ▪ Class Test: 10 ▪ Assignment: 10 ▪ Presentation: 10 Above criterion is tentative in nature. Deans may formulate an appropriate criterion for their Academic Faculties. Institute should report marks out of total 40 to University's Examination Section. | Maximum Marks: 60 <ul style="list-style-type: none"> ▪ Only one section containing 8 (eight) questions of 10 marks each. ▪ Attempt any 6 (six) questions | 3 Hours (180 minutes) | Each answer sheet will be evaluated by two examiners (internal and external) and their average is taken | (6 Different Question Papers) <ol style="list-style-type: none"> 1. All faculties from Group-1 2. Faculty of Pharmaceutical Sciences and Faculty of Science 3. Faculty of Arts, Social Science and Commerce 4. Faculty of Law 5. Faculty of Management Studies 6. Faculty of Engineering and Technology Composition of paper setters' panel: <ul style="list-style-type: none"> ▪ Each Dean should submit a panel consisting of one Internal and one External member. ▪ CoE will select any one panel for paper setting as appropriate. |

| | | | | | | | |
|---|---|---|--|--|-----------------------|--|---|
| <p>Recent Advances in <Subject></p> <ul style="list-style-type: none"> ▪ 40% Internal Assessment ▪ 60% University Examination | 4 | <p>Subject Specific Syllabus</p> | <p>Maximum Marks: 40</p> <ul style="list-style-type: none"> ▪ Class Participation: 10 ▪ Class Test: 10 ▪ Assignment: 10 ▪ Presentation: 10 <p>Above criterion is tentative in nature. Deans may formulate an appropriate criterion for their Academic Faculties.</p> <p>Institute should report marks out of total 40 to University's Examination Section.</p> | <p>Maximum Marks: 60</p> <ul style="list-style-type: none"> ▪ Only one section containing 8 (eight) questions of 10 marks each. ▪ Attempt any 6 (six) questions. | 3 Hours (180 minutes) | <p>Each answer sheet will be evaluated by two examiners (internal and external) and their average is taken</p> | <p>(Subject-wise Question Papers)</p> <p>Different papers for different Subjects set by respective panels.</p> <p>Composition of paper setters' panel:</p> <ul style="list-style-type: none"> ▪ Each Dean should submit a panel consisting of one Internal and one External member for each Subject. |
| <p>Presentations on Proposed Research Work</p> <ul style="list-style-type: none"> ▪ 100% Internal Assessment | 2 | <p><syllabus is not required></p> <p>(Deans need to formulate guidelines for their Academic Faculties.)</p> <p>Composition of the Internal Evaluation Committee:</p> <ul style="list-style-type: none"> ▪ Ph.D. Guide ▪ Head of the Department ▪ One Internal Senior Faculty Member from the Subject ▪ One External Expert from the Subject | <p>Maximum Marks: 50</p> <p>Assessment to be done as per the schedule communicated by University's Examination Section.</p> <p>Ph.D. Scholar should give only one presentation in front of the committee and the committee will assess it for 50 marks (25+25).</p> <ul style="list-style-type: none"> ▪ Review of Literature: 25 ▪ Proposed Research Work: 25 <p>Institute should report marks out of total 50 to University's Examination Section.</p> | - | - | - | - |

| | | | | | | | |
|--|---|---|---|---|------------------------|--|--|
| <p>Research and Publication Ethics</p> <ul style="list-style-type: none"> ▪ 40% Internal Assessment ▪ 60% University Examination | 2 | <p>UGC's Common Syllabus for all Faculties</p> <p>(syllabus recommended by UGC)</p> | <p>Maximum Marks: 20</p> <ul style="list-style-type: none"> ▪ Class Participation: 10 ▪ Paper Publication: 10 (e.g., Review Article - marks may be assigned as per article's stage: draft / submitted / accepted/published) <p>Above criterion is tentative in nature. Deans may formulate an appropriate criterion for their Academic Faculties.</p> <p>Institute should report marks out of total 20 to University's Examination Section.</p> | <p>Maximum Marks: 30</p> <ul style="list-style-type: none"> ▪ Only one section containing 5 (five) questions of 10 marks each. ▪ Attempt any 3 (three) questions. | 1.5 Hours (90 minutes) | <p>Each answer sheet will be evaluated by two examiners (internal and external) and their average is taken</p> | <p>(One Common Question Paper)</p> <p>One common question paper for all Academic Faculties set by one panel.</p> <p>Composition of paper setters' panel:</p> <ul style="list-style-type: none"> ▪ Each Dean should submit a panel consisting of one Internal and one External member. ▪ CoE will select any one panel for paper setting. |
|--|---|---|---|---|------------------------|--|--|

Declaration of Result for Ph.D. Coursework Examination:

- BVDU's 10 Point Grading System will be used for declaration of result.
- Combined passing (IE+UE) for a course with minimum 50% in total (IE+UE) to pass a course.
- A Ph.D. Scholar must score minimum 55% overall to pass the Ph.D. Coursework.

Bharati Vidyapeeth Deemed University
College of Nursing, Pune
Pre- PhD Course schedule: 2023-24
Course-I: Research Methodology

| Unit No | Unit content | Periods (Lecture) | Practical Hours |
|---------|--|-------------------|-----------------|
| 1. | Chapter-1: Introduction | 2 | |
| 2. | Chapter-2: Review of Literature | 4 | 2 |
| 3. | Chapter-3: Research Approach And Design | 4 | 4 |
| 4. | Chapter-4: Research Problem | 2 | 2 |
| 5. | Chapter-5: Developing theoretical and Conceptual Framework | 2 | 2 |
| 6. | Chapter-6: Sampling | 4 | 3 |
| 7. | Chapter-7: Tool and Methods of Data Collection | 4 | 6 |
| 8. | Chapter-8: Analysis and interpretation of Data | 4 | 6 |
| 9. | Reporting and utilizing research findings | 2 | 3 |
| 10. | Dissemination & Publication of research findings | 2 | 2 |
| | Total | 30 | 30 |

Bharati Vidyapeeth Deemed University
College of Nursing, Pune
Pre- PhD Course schedule: 2023-24
Course-II: Recent advances in Nursing

| Unit No | Unit content | Periods (Lecture) |
|--|---|----------------------|
| I | Introduction | 1 |
| | Health problems at National & Global level | 2 |
| | Current status of Nursing across globe | 2 |
| | Current status of Nursing in India | 2 |
| II | Philosophy of Nursing science | 2 |
| | Nursing as a science and a discipline | 2 |
| | Paradigm in Nursing | 2 |
| | Domains of Nursing Practice | 2 |
| III | Epistemology (Concepts, statement and theories) | 2 |
| | Strategies of Theory development | 2 |
| | Importance of theory of Nursing & classification of theories in Nursing | 2 |
| | Issues in Theory development in Nursing | 2 |
| IV | The Nursing Metaparadigm | 2 |
| | Florence Nightingale theory : its implication in nursing & research | 2 |
| | Pepalu theory : its implication in nursing & research | 2 |
| | Virginia Henderson theory : its implication in nursing & research | 2 |
| | Abdellah theory : its implication in nursing & research | 2 |
| | Orlando theory : its implication in nursing & research | 2 |
| | Orem theory : its implication in nursing & research | 2 |
| | Imogene King theory : its implication in nursing & research | 2 |
| | Betty Neuman theory : its implication in nursing & research | 2 |
| | Sister Callista Roy theory : its implication in nursing & research | 2 |
| | Ramona T. Mercer theory : its implication in nursing & research | 2 |
| | Lydia E. Hall theory : its implication in nursing & research | 2 |
| | Jean Watson theory : its implication in nursing & research | 2 |
| | Dorothy E. Johnson theory : its implication in nursing & research | 2 |
| Nola J Pender theory : its implication in nursing & research | 2 | |
| V | Nursing ethics | 2 |

| Unit No | Unit content | Periods (Lecture) |
|----------------|---------------------------------------|------------------------------|
| VI | Nursing leadership & related theories | 2 |
| VII | Basics of Computer | 2 |
| | Total Hours | 60 |

Bharati Vidyapeeth Deemed University
College of Nursing, Pune
Pre- PhD Course schedule: 2023-24

Course-III: Research and Publications Ethics (RPE): 15+15= 30 Hours

| Unit No | Unit content | Periods (Lecture) | Practical (Hrs) |
|---------|---|-------------------|-----------------|
| 1. | Philosophy & Ethics Introduction to philosophy: Definition, nature and scope, concept, branches | 2 | 0 |
| 2. | Philosophy & Ethics Ethics: Definition, moral philosophy, nature of moral judgment and reactions | 2 | 0 |
| 3. | Scientific Misconduct Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct, Intellectual honesty and research integrity | 2 | 0 |
| 4. | Scientific Misconduct Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism, Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data. | 2 | 0 |
| 5. | Publication Ethics Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper, Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc | 2 | 0 |
| 6. | Publication Ethics Conflicts of interest with copyrights and patents, Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types | 2 | 0 |
| 7. | Publication Ethics Violation of publication ethics, authorship and contributor ship, Dominant laws regarding research ethics, Infringement and enforcement of Copyright and Patents | 3 | 0 |
| 8. | Open Access Publishing Open Access Publications and Initiatives SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies | 0 | 2 |
| 9. | Open Access Publishing Software tool to identify predatory publications developed by SPPU, Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Springer Journal Suggester, etc. | 0 | 2 |

| Unit No | Unit content | Periods (Lecture) | Practical (Hrs) |
|----------------|---|--------------------------|------------------------|
| 10. | Publication Misconduct: Group Discussions Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad, Peer review process | 0 | 2 |
| 11. | Publication Misconduct: Software Tools Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools. | 0 | 2 |
| 12. | Database and Research Metrics: Databases Indexing databases, Citation Databases: Web of Science, Scopus, etc. Open databases | 0 | 4 |
| 13. | Research Metrics Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero Platforms for citation and referencing. | 0 | 3 |
| | Total | 15 | 15 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule (2023-2024)
Faculty of Nursing

| Subjects | Prescribed Hours | Hours will be Given | Norms | Credit Distribution | Credits by BV(DU) |
|-------------------------------|-------------------------|----------------------------|---------------|----------------------------|--------------------------|
| Research Methodology | 60 | | As per BV(DU) | 1 Credit= 15 Hours | 04 |
| Recent advances Nursing (RAN) | 60 | | As per BV(DU) | | 04 |
| Ethics | 30 | | As per BV(DU) | | 02 |
| Presentation | 30 | | As per BV(DU) | | 02 |
| Total | 240 | | | | 12 |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

1st week – 18/9/2023 – 23/09/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|------------------------|---------------|
| Research methodology (RM) | 04 | Started |
| Recent advances Nursing (RAN) | 04 | Started |
| Presentations on proposed research work (Presentations) | 02 | Started |
| Research and publications ethics (Ethics) | 02 | Started |
| Total | 12 | Started |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule
Faculty of Nursing
2nd week - 25/9/2023 – 30/09/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|--------------------|--------------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|-----------------|---------|
| Research methodology (RM) | 08 | Ongoing |
| Recent advances Nursing (RAN) | 08 | Ongoing |
| Presentations on proposed research work (Presentations) | 04 | Ongoing |
| Research and publications ethics (Ethics) | 04 | Ongoing |
| Total | 24 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

3rd week - 03/10/2023 – 07/10/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|------------------------|----------------|
| Research methodology (RM) | 12 | Ongoing |
| Recent advances Nursing (RAN) | 12 | Ongoing |
| Presentations on proposed research work (Presentations) | 06 | Ongoing |
| Research and publications ethics (Ethics) | 06 | Ongoing |
| Total | 36 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

4th week - - 09/10/2023 – 14/10/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|------------------------|----------------|
| Research methodology (RM) | 16 | Ongoing |
| Recent advances Nursing (RAN) | 16 | Ongoing |
| Presentations on proposed research work (Presentations) | 08 | Ongoing |
| Research and publications ethics (Ethics) | 08 | Ongoing |
| Total | 48 | Ongoing |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule
Faculty of Nursing
5th week - 16/10/2023 – 21/10/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|--------------------|--------------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|-----------------|---------|
| Research methodology (RM) | 20 | Ongoing |
| Recent advances Nursing (RAN) | 20 | Ongoing |
| Presentations on proposed research work (Presentations) | 10 | Ongoing |
| Research and publications ethics (Ethics) | 10 | Ongoing |
| Total | 60 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

6th week - 23/10/2023 – 28/10/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | | Half Day | | |

| Course | Hours Completed | Status |
|--|------------------------|----------------|
| Research methodology (RM) | 24 | Ongoing |
| Recent advances Nursing (RAN) | 24 | Ongoing |
| Presentations on proposed research work (Presentations) | 12 | Ongoing |
| Research and publications ethics (Ethics) | 12 | Ongoing |
| Total | 72 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

7th week- 30/10/2023 – 04/11/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|------------------------|---------------|
| Research methodology (RM) | 28 | Ongoing |
| Recent advances Nursing (RAN) | 28 | Ongoing |
| Presentations on proposed research work (Presentations) | 14 | Ongoing |
| Research and publications ethics (Ethics) | 14 | Ongoing |
| Total | 84 | Ongoing |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule
Faculty of Nursing
8th week - 06/11/2023 – 11/11/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|-----------------|-----------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|---|-----------------|---------|
| Research methodology (RM) | 32 | Ongoing |
| Recent advances Nursing (RAN) | 32 | Ongoing |
| Presentations on proposed research work (Presentations) | 16 | Ongoing |
| Research and publications ethics (Ethics) | 16 | Ongoing |
| Total | 96 | Ongoing |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule
Faculty of Nursing
9th week - 13/11/2023 – 18/11/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|--------------------|--------------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|-----------------|---------|
| Research methodology (RM) | 36 | Ongoing |
| Recent advances Nursing (RAN) | 36 | Ongoing |
| Presentations on proposed research work (Presentations) | 18 | Ongoing |
| Research and publications ethics (Ethics) | 18 | Ongoing |
| Total | 108 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

10th week - 20/11/2023 – 25/11/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | | Half Day | | |

| Course | Hours Completed | Status |
|--|------------------------|----------------|
| Research methodology (RM) | 40 | Ongoing |
| Recent advances Nursing (RAN) | 40 | Ongoing |
| Presentations on proposed research work (Presentations) | 20 | Ongoing |
| Research and publications ethics (Ethics) | 20 | Ongoing |
| Total | 120 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

11th week - 27/11/2023 – 02/12/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | | Half Day | | |

| Course | Hours Completed | Status |
|--|------------------------|---------------|
| Research methodology (RM) | 44 | Ongoing |
| Recent advances Nursing (RAN) | 44 | Ongoing |
| Presentations on proposed research work (Presentations) | 22 | Ongoing |
| Research and publications ethics (Ethics) | 22 | Ongoing |
| Total | 132 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

12th week- 04/12/2023 – 09/12/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | | Half Day | | |

| Course | Hours Completed | Status |
|--|------------------------|---------------|
| Research methodology (RM) | 48 | Ongoing |
| Recent advances Nursing (RAN) | 48 | Ongoing |
| Presentations on proposed research work (Presentations) | 24 | Ongoing |
| Research and publications ethics (Ethics) | 24 | Ongoing |
| Total | 144 | Ongoing |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43
Pre PhD Course work Schedule
Faculty of Nursing
13th week - 11/12/2023 – 16/12/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|--------------------|--------------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|-----------------|---------|
| Research methodology (RM) | 52 | Ongoing |
| Recent advances Nursing (RAN) | 52 | Ongoing |
| Presentations on proposed research work (Presentations) | 26 | Ongoing |
| Research and publications ethics (Ethics) | 26 | Ongoing |
| Total | 156 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

14th week - 18/12/2023 – 23/12/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------|-------|--------|---------|---------|--------|----------|--------------------|--------------------------|-------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | Half Day | | | |

| Course | Hours Completed | Status |
|--|-----------------|---------|
| Research methodology (RM) | 56 | Ongoing |
| Recent advances Nursing (RAN) | 56 | Ongoing |
| Presentations on proposed research work (Presentations) | 28 | Ongoing |
| Research and publications ethics (Ethics) | 28 | Ongoing |
| Total | 168 | Ongoing |

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
COLLEGE OF NURSING, DHANKAWADI, PUNE-43**

Pre PhD Course work Schedule

Faculty of Nursing

15th week - 25/12/2023 – 30/12/2023

| DAY/TIME | 8-9AM | 9-10AM | 10-11AM | 11-12AM | 12-1PM | 1-2PM | 2-3PM | 3-4PM | 4-5PM |
|-----------------|--------------|---------------|----------------|----------------|---------------|--------------|--------------------|--------------------------|--------------|
| Monday | | | | | | Lunch | | | |
| Tuesday | | | | | | Lunch | RM (Online) | | |
| Wednesday | | | | | | Lunch | (RAN) (Online) | | |
| Thursday | | | | | | Lunch | Ethics (Online) | Presentation (Online) | |
| Friday | | RM | | (RAN) | | Lunch | Ethics | Presentation | |
| Saturday | | | | | | | Half Day | | |

| Course | Hours Completed | Status |
|--|------------------------|------------------|
| Research methodology (RM) | 60 | Completed |
| Recent advances Nursing (RAN) | 60 | Completed |
| Presentations on proposed research work (Presentations) | 30 | Completed |
| Research and publications ethics (Ethics) | 30 | Completed |
| Total | 180 | |

BHARATI VIDYAPEETH
Deemed to be University

AYURVED
**[Pre Ph. D.-Six month course work
structure]**

Faculty of Ayurved

BHARATI VIDYAPEETH Deemed to be University
Pune-411030

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Ph.D. Coursework Structure and Syllabus

UGC (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022:

- Ph.D. Coursework of minimum 12 Credits, including “Research Methodology” and “Research and Publication Ethics” courses (4 and 2 credits respectively)
- A Ph.D. Scholar must obtain a minimum of 55% marks or its equivalent grade in the UGC 10-point scale in Ph.D. Coursework.

| Course | Credits | Syllabus | Assessment | |
|--|---------|--|---|--|
| | | | Internal Evaluation (IE) | University Examination (UE) |
| Research Methodology | 4 | Common syllabus for all (syllabus designed by the committee headed by Prof. Dr. Sachin Vernekar) | Maximum Marks: 40 <ul style="list-style-type: none"> ▪ Class Participation: 10 ▪ Assignment / Objective Test: 10 ▪ Presentation: 20 | Maximum Marks: 60 Duration: 3 Hours (180 minutes) <ul style="list-style-type: none"> ▪ Only one section containing 8 questions of 10 marks each ▪ Attempt any 6 questions ▪ Each answer sheet will be evaluated by two examiners (internal and external) and their average is taken |
| Recent Advances in <Subject> (Subject names as listed in Ph.D. Brochure) <ul style="list-style-type: none"> ▪ Recent Advances in Physical Education ▪ Recent Advances in Chemistry ▪ Recent Advances in Law etc. | 4 | Subject specific syllabus (Deans need to prepare the syllabi for all Subjects, as listed in Ph.D. Brochure, under their Academic Faculty.) | Above criterion is tentative in nature. Deans may formulate an appropriate criterion for their Academic Faculties. | |
| Presentations on Proposed Research Work | 2 | Syllabus is not required. (Deans need to formulate guidelines for their Academic Faculties.) | Maximum Marks: 50 <ul style="list-style-type: none"> ▪ Review of Literature: 25 ▪ Proposed Research Work: 25 | - |
| Research and Publication Ethics | 2 | Common syllabus for all (syllabus recommended by UGC) | Maximum Marks: 20 <ul style="list-style-type: none"> ▪ Class Participation: 10 ▪ Review published/communicated: 10 Above criterion is tentative in nature. Deans may formulate an appropriate criterion for their Academic Faculties. | Maximum Marks: 30 Duration: 1.5 Hours (90 minutes) <ul style="list-style-type: none"> ▪ Only one section containing 5 questions of 10 marks each ▪ Attempt any 3 questions ▪ Each answer sheet will be evaluated by two examiners (internal and external) and their average is taken |

Coursework Result:

- Combined passing for each course (IE+UE)
- Minimum percentage to pass a course as well as entire coursework: 55%
- Grading System: UGC 10-point scale

Paper I
BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE
Faculty of Ayurved Ph.D. Coursework
Paper 01: Research Methodology (4 Credits)

Part A: For Written Exam

| Units | Topics |
|-------|--|
| 1 | <p>Introduction to Research: Definition, meaning, characteristics of Research, Types of Research, Introduction Nature of qualitative and quantitative research, Research in functional areas of Ayurved, Process of Research, Formulation of Research Design. Types of research designs</p> <p>Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Sources of Research Problems, Research Avenues in Different Business Sectors – IT, Manufacturing, Agriculture, Services etc.</p> <p>Conceptual Frameworks, Literature Review Process – Role, importance, sources, methods, software tools for literature review.</p> <p>Formulation of Research Problem – Introduction, Review of Literature, Objectives, hypothesis, scope, limitations etc</p> |
| 2 | <p>Research Design – Meaning, Need, Types of research design – Exploratory, Descriptive, Causal Research Design, Subject Specific research design, model building techniques and testing methods, features of good research design. Subject Specific Experiments, surveys and case study research</p> <p>Concept of Population and Sample, Census Survey and Sample Survey; Nature and Limitations; Sampling: Sampling design: Meaning, logic and application of sampling. Sampling terminology: Universe, population, sampling frame, sample size, Determination of sample size, Methods of sampling: Probability and non-probability sampling, Criteria of choosing an appropriate sampling method.</p> <p>Introduction to Measurement: Meaning and Approaches; Types of Measurement: Measurement scales- nominal, ordinal, interval and ratio scales, Reliability and Validity of measures. Pilot study</p> |
| 3 | <p>Data Collection Methods: Types and Sources of Data, Interviews –telephonic, personal, Observation – Direct and Indirect, Questionnaires, Schedules through enumerators, Other Methods – mechanical devices, projective techniques etc. Questionnaire construction and interview schedule. Survey techniques. Designing the instrument for data</p> |

| | |
|---|--|
| | <p>collection. Processing of Data – Editing, Coding, Classification and Tabulation of Data.</p> <p>Data Analysis: Organization and presentation of data, Univariate, Bivariate and Multivariate Analysis; Tools of Descriptive statistics and their applications. Likert Scale Data Analysis, Factor Analysis, Regression Analysis – Linear and Logistic, Analysis of variance (ANOVA), Test of Hypothesis, Parametric and Non-parametric tests - chi-square test, t-test and z-test. Nature and methods non-parametric statistical test.</p> |
| 4 | <p>Presentation and Publication of Research: Research Proposal, Research Paper, Research Thesis, Research Report, Report Writing: Pre writing considerations, Formats of publications in Research journals, Research Proposal, Format for writing reports, bibliography, and references using Reference Management System, citing different sources</p> <p>Ethics in Research: Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. Qualities of good Researcher.</p> |
| 5 | <p>ICT Tools for Research – Definition of ICT, Related Concepts and Technologies, Use of ICT Tools, Impact of ICT on Educational, Social and Economic Development, Role of computers in research, maintenance of data using software such as Mendeley, Zotero, Endnote, Tabulation and graphical presentation of research data and software tools like EViews, MATLAB, Minitab. Use of Internet in Research: Browsing the internet through standard features, Accessing and Downloading information, E-resources for research, Impact Factor: E - Information, H-Index, citation index, e-journals etc. Web search: Introduction to Internet, use of Internet and WWW, using search engines and advanced search tools.</p> |
| 6 | <p>PRACTICAL INPUTS on the following through WORKSHOPS</p> <p>Spreadsheet Tool: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features.</p> <p>Tools used may be Microsoft Excel, Tools for Data Analysis - SPSS for data analysis, Open Source Software for Research- R Programming for Research ICT for Research</p> |

Paper II

A Specialized Subject

2.1 Ayurved Samhita and Siddhant

Marks- 100

Credit- 4 Credits - Hours – 60 hours [each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|--|----------|
| 1. | <ul style="list-style-type: none">• Charak Samhita Sutrasthan & CharakSamhita Chikitsasthan with ChakrapaniCommentary .• Importance of CharakSamhita in present era for maintenance of health & treatment of diseases.• AnuktaVyadhiChikitsa Siddhant from Charak Samhita. | 15 hours |
| 2 | <ul style="list-style-type: none">• Special features of “Chikitsa” from SushrutSamhita.• NidanaSthan from SushrutSamhita with Dalhan and Gayadas commentaries.• Special features of SutraSthan ofSushrutSamhita with Dalhan and Chakrapani commentaries. | 15 hours |
| 3 | <ul style="list-style-type: none">• Dietary principles from Ashtang Hridaya & Ashtang Sangrah.• Life Style disorders.• Rasayan &Vajikarana Chikitsa from Bruhatrayee.• Peer reviewed journals in Ayurved. | 15 hours |
| 4 | <ul style="list-style-type: none">• Fundamental principles related to Mind.• Role of Mind in health maintenance in current era• Update researches on Dosha Dhatu Mala .• Manuscriptology | 15 hours |

2.2 Kriya Sharir

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No | Topic | Hrs | Total hrs |
|--------|--|-----|-----------|
| 1. | <u>Study of Basic principles related to Kriya Sharir</u> | | 15 |
| | Panchabhautic Siddhant Lokpurush SiddhantSamanya Vishesh SiddhantTrigun Tridosha Siddhant | 4 | |
| | Applied aspect of Prakruti. Study of Deha and Manas Prakruti their classification and features of different Prakruti | 3 | |
| | Applied aspect of Sarata | 3 | |
| | Ayurvedic concept of Manas Atma and Indriya- (Description of Manas properties its location, objects functions and qualities Mechanism of Dyanotpatti) | 2 | |
| | Physiology of sleep and dreams, physiology of cognitive processes | 2 | |
| | Description of concept of Atma and its features | 1 | |
| 2 | <u>Applied aspect of Dosha Dhatu Mala</u> | | 15 |
| | Physiological study of Human body as a composite of Dosha, Dhatu and Mala. | 3 | |
| | Properties, qualities, functions, locations and types of Dosha Dhatu and Mala, their Panchabhautika | 3 | |
| | composition Causes and features of Vriddhi and Kshaya of DoshaDhatu and Malas. | 3 | |
| | Description of Ojas. | 1 | |
| | Define Immunity. Types of immunity | 1 | |
| | Mechanisms of formation of urine, feces and sweat; | 2 | |

| | | | |
|---|--|---|----|
| | their functions according to Ayurveda and modern science. Physiology, Histology and functional anatomy of Excretory system. | | |
| | Modern laboratory and Ayurvedic and clinical methods to assess the functioning of Dosha, Dhatu, Mala and other factors | 2 | |
| 3 | <u>Ayurvedic and modern concept of Digestion</u> | | 15 |
| | Study of Ahar and its allied aspect | 2 | |
| | Study of Agni .Functions of Jatharagni, Bhutagni and Dhatvagni in detail. | 3 | |
| | Detailed study of Ahar Awasthapak ,Vipak, | 2 | |
| | Phenomenon of Koshtha. | 1 | |
| | Physiology Histology and functional anatomy of Digestive System. | 2 | |
| | Study of Liver Spleen Pancreas. | 2 | |
| | Basic biochemistry of digestion, absorption, and metabolism of fats, proteins, carbohydrates, vitamins, minerals and water. | 3 | |
| 4 | <u>Ayurvedic and Modern Physiology of Body Systems</u> | | 15 |
| | Physiology Histology and functional anatomy of Cardiovascular system | 2 | |
| | Physiology Histology and functional anatomy of Respiratory system | 2 | |
| | Physiology Histology and functional anatomy of Reproductive system. | 2 | |
| | Ayurvedic and modern views on physiology of nervous system including physiology of special senses | 2 | |
| | Physiological study of Endocrinology. | 2 | |
| | Instruments related to Kriya Sharir | 2 | |
| | Modern methods for quantitative assessment of various body components; Development of possible objective parameters.Techniques and principles of associated instruments. | 2 | |
| | Description of recent advances in the understanding of different biophysical and Biochemical mechanisms involved in physiology and their correlation with Ayurvedic Fundamentals | 1 | |

2.3 Rachana Sharir

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No/ Sections | Details of Topics | Hours of Teaching Learning/Credit |
|---------------------|--|--|
| 1. | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sutrasthan</p> <ol style="list-style-type: none">1. Adhyaya 1. :- Vedotpatti2. Adhyaya 2.:- Shishyopnayaniya3. Adhyaya 3.:- Adhyayansampradaniya4. Adhyaya 4.:- Prabhashaniya5. Adhyaya 5.:- Agroupaharniya6. Adhyaya 14.:- Shonitvarniya <p>Sushrut Samhita Sharirsthan</p> <ol style="list-style-type: none">7. Adhyaya 1.:- Sarvabhutachintasharir | <p style="text-align: center;">15</p> <p style="text-align: center;">.....</p> <p style="text-align: center;">1 Credit</p> |
| 2. | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sutrasthan</p> <ol style="list-style-type: none">1. Adhyaya 15.:- Doshdhatumalakshyavrudhividnyaniya2. Adhyaya 20.:- Hitahita3. Adhyaya 21.:- Vranaprashna <p>Sushrut Samhita Sharirsthan</p> | |

| | | |
|---|--|--|
| | <p>4. Adhyaya 2. :- Sukrashonitsuddhisharir</p> <p>5. Adhyaya 3.:- Garbhaavakrantisharir</p> <p>6. Adhyaya 4.:- Garbhavyakaransharir</p> <p>7. Adhyaya 5.:- Sharirsamkyavyakaransharir</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |
| 3 | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Nidsansthan</p> <p>1. Adhyaya 1.:- Vatavyadhinidan</p> <p>2. Adhyaya 15.:- Bhagnanidan</p> <p>Sushrut Samhita Sharirsthan</p> <p>3. Adhyaya 7.:- Siravarnavibhaktisharir</p> <p>4. Adhyaya 8.:- Siravyadhvidhishsarir</p> <p>5. Adhyaya 9.:- Dhamanivyakaransharir (Basic principles of Sira Dhamani and Srotassharir)</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |
| 4 | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sharirsthan</p> <p>1. Adhyaya 6.:- Pratekmarmanirdeshsarir</p> <p>2. Adhyaya 10.:- Garbhinivyakaransharir</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |

2.4 Agad Tantra, Vyavahar Ayurved evam Vidhi Vaidyak

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | <ul style="list-style-type: none"> • Definition & properties of <i>Visha</i>, <i>Visha samprapti</i>, <i>Vishaprabhava</i>, <i>Vishavega</i>, <i>vegantara</i> and <i>Vishakarmukata</i>, <i>Shankavisha</i> & <i>Vishasankat</i> (toxicodynamic and toxicokinetic study). • Garavisha and Dushi visha, their varieties, signs, symptoms and management with contemporary relevance. • Detailed study of Allergies including allergic manifestations in the eyes, nose, lungs and skin • Fundamental Principles for treatment of poisoning • <i>Chaturvinshati Upakrama</i> (24 management procedures). • Extra -corporeal techniques (dialysis etc) for removal of poisons. <p>Emergency medical management of poisoning including preparation, administration and complications of anti-venoms /anti-sera</p> <ul style="list-style-type: none"> • Descriptive study of <i>Sthavara visha</i>, definition, classifications, classical signs and symptoms of poisoning of <i>Sthavara visha</i> including <i>Vanaspatik</i> (phyto poison), <i>Khanija</i> (mineral) • General and specific treatment of different types of <i>Sthavara visha</i>. • Study of process for <i>Sodhana</i>, <i>Marana Sanskara</i> of poisonous drugs before therapeutic use. | 15 |
| 2. | <ul style="list-style-type: none"> • Study of <i>Jangama visha</i> and their sources, descriptive study of ancient and contemporary knowledge of <i>Sarpavisha</i>, <i>Vrischika</i>, <i>Alarka</i> etc.their pathologic manifestations including their role as a causative factor in communicable diseases eg. vector borne diseases • General and specific treatment of different types of <i>Jangam visha</i>. • Detailed study of the contemporary knowledge about <i>Vishajanya Janpadodhvansaniya roga</i> (community health problems due to poisons & Environmental pollution, Water pollution, Soil pollution, Air pollution, Industrial pollutions, Agrochemicals toxicity etc). Their features and management according to ancient and recent concepts. • Concept of <i>Virudhaahar</i>, <i>Aahara visha</i> and <i>Satmy-Asatmyata</i> in contemporary and Ayurvedic views. • Management of food poisoning • Detailed study of <i>Madya visha</i> and substances acting on the nervous system; substance abuse. Their diagnosis, management | 15 |

| | | |
|----|--|----|
| | <ul style="list-style-type: none"> • Role of for Forensic Science Laboratory in suspected poisoning and medico-legal cases. <p>Duty of physician in cases of poisoning, suspected poisoning and their Post mortem findings</p> | |
| 3. | <ul style="list-style-type: none"> • Personal identity and its medico-legal aspects • Death and its medico-legal aspects (Forensic Thanatology) • Violent asphyxia deaths and its medico-legal importance. • Injuries due to various weapons, firearm, explosions, chemical and nuclear warfare, heat and cold, lightening and electricity and its Medico-legal aspects. • Virginitiy, Impotence, Sterility and their medico-legal aspects. • Regulations of Artificial Insemination and surrogate motherhood • Sexual offences and perversions. • Medico-legal aspects of, Pregnancy, Delivery, Abortion, Infanticide and Legitimacy with related acts • Medico legal aspects of mental illness | 15 |
| 4. | <ul style="list-style-type: none"> • Courts and Legal procedures • Study of medico-legal acts like Indian Evidence Act, Pre conceptional Pre Natal Diagnostic Test Act, Nursing Home Act, Human Organ Transplantation Act, Drugs and Cosmetic Act 1940, Narcotic drugs and Psychotropic substances Act 1985, Pharmacy Act 1948, Drugs and Magical Remedies (Objectionable Advertisements) Act 1954, Medicinal and Toilet Preparations Act 1955 and Anatomy Act etc. • Duties and privileges of physician as per ancient and contemporary science. • Professional secrecy and privileged communication. Professional negligence and malpractice. • Doctor - patient relationship. Rights and privileges of patients, Euthanasia. Consumer Protection Act related to medical practice • Indemnity Insurance scheme. • Structure of Central Council of Indian Medicine, its jurisdiction and functions. Code and Conducts as per the CCIM, Rules and Regulations there under. • Respective State Council of Indian Medicine, its structure, power, voluntary duties | 15 |

2.5 Rasashashtra and Bhaishjya Kalpana Vigyan

Marks- 100

Credit- 4 Credits - Hours – 60 hours [each credit- 15 hours].

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | <p>Dravyavargikaran And Parichaya [Classification and Pharmacognosy]</p> <ul style="list-style-type: none"> • Contemporary status of the branch Rasashastra and Bhaishajya kalpana. • Various systems of classification of drugs of natural origin i.e. medicinal plants, mineral ores, metals and animal products, specific terminology of the drugs [paryay and paribhasha] • Brief outline of occurrence, distribution, useful parts, identification tests, collection, preservation and storage methods of raw drugs. • Introduction to pharmacognosy of all types of Dravya – ahara and aushadha - traditional and modern • Detail study of ahardravyavarga, aharakalpana and concept of pathyapathya kalpana. Developments regarding functional foods, nutraceuticals, and therapeutic foods | 10 |
| 2. | <p>Kalpanirman siddhant [Principles of Pharmaceutics]:</p> <p>Metrology: Systems of weights and measures. Ayurvedic methods of measurement, Manparibhasha. Metric System and Calculations including conversion from one to another system and percentage calculations</p> <p>Introduction of pharmaceutical applications/procedures of drugs from all categories</p> <p>Basic Principles of Formulations of herbal drugs and mineral drugs. Fundamental dosage forms: [Panchavidhakashay, advanced and modified kalpana] and mineral drugs [Shuddha Dravya, Bhasma, Satva, Druti, and Parad Kalpana</p> <p>Basic principles of pharmaceutical chemistry</p> <p>Packaging of Pharmaceuticals – Desirable features of a</p> | 20 |

| | | |
|-----------|---|-----------|
| | <p>container.</p> <p>Types of containers. Study of glass & plastic as materials for containers & rubber as material for closure. Merits & demerits of storage materials. Information regarding traditional packaging & storage materials, their merits & demerits.</p> | |
| 3. | <p>Aushdhi Karmukata Vichar [Pharmacology]</p> <ul style="list-style-type: none"> • Introduction to Ayurvedic Pharmacology (rasa virya vipaka guna karma) & its scope. Pharmacological classification and action of drugs according to srotasa. • Routes of Drug administration their advantages & disadvantages of Bheshajprayogmarga, Bheshajaprayoga kal. [Posology] • Ayurvedic drugs and formulations used for various new conditions, syndromes, and infectious diseases like thyroids, CAD, swine flue, COVID 19 | 20 |
| 4. | <p>Itihas and Vangamaya [Literature: ancient and modern]</p> <ul style="list-style-type: none"> • History of [Bheshaja] drug in man. Definition, chronological review of Rasabhaishajyakalpana and its scope in indigenous system of medicine. • Introduction to pharmacopoeias with special reference to Indian pharmacopoeias. • Drug research guidelines and phases. • Most researched rasa drugs and the rationale for the same • Research regarding concepts of Rasa shastra and Bhaishajya Kalpana. • Various Research models to evaluate safety and efficacy of Rasa dravya. • Evidences against safety and efficacy of Herbo-mineral / metallic formulations and their interpretation • Publication and research writing particular to RSBK • Concerns expressed by non-Ayurvedic scientists on making of and use of mercurial metallic / herbo-mineral formulations in therapeutics | 10 |

2.6 Dravya Guna Vigyan

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | Pharmacognosy- Importance and different methods of classification according to Ayurved and modern and Namrupavigyan | 4 |
| 2. | Brief knowledge regarding controversy, substitutes and adulterants of herbal drugs, Neutraceuticals, Cosmoceuticals, food addictives etc. | 4 |
| 3. | Gunakarma Vigyan- Applied aspect of fundamentals of Dravya gunavigyan- Rasa, Guna, Veerya, Vipaka- Knowledge & interpretation of Bruhatrayi, Laghutrayi along with their Commentators | 4 |
| 4. | Karma- Vigyan-Comprehensive study of karma as defined in Brihatrayee & Laghutrayee | 4 |
| 5. | Prashasta Bhesaja Parikshana as per Charakacharya Standardization of crude drugs- [as per Ayurved pharmacopeia & WHO guideline]- Pharmacognostical study of different parts of the plants with reference to Macroscopic and microscopic study and Qualitative and Quantitative analysis like foreign matter, extractive (water and alcohol), ash value, acid insoluble ash and TLC separation.; Methods of drugs Standardization and Quality control; Biomarkers | 5 |
| 6. | Knowledge of clinical pharmacology and clinical drug research as per GCP guidelines | 3 |
| 7. | Sandighdravya & Anuktadravya- Knowledge of methodology and guna and karma of anuktadravyas | 3 |
| 8. | Toxic drugs-Purification of Poisonous plants- Studies on changes occurring in purification of poisonous plants drug | 2 |
| 9. | Study of Aharadravya | 5 |
| 10. | Principle of drug administration and drug delivery regimen, and clinical pharmacological evaluation [therapeutic administration] of drugs | 5 |
| 11. | Principles of clinical pharmacology and Introduction to reverse pharmacology | 3 |

| | | |
|-----|--|---|
| 12. | Experimental pharmacology- Introduction to experimental pharmacology with special reference to various drug activities | 3 |
| 13. | Brief knowledge regarding Pharmaco-vigilances-Knowledge of Pharmaco-vigilance in Ayurveda & modern medicine, Adverse drug reactions & drug interaction of medicinal plants, Drug incompatibility | 4 |
| 14. | Dashemanigana and Agryasangraha | 4 |
| 15. | TKDL (Traditional Knowledge of Digital Library) Various acts- Knowledge of TKDL, Introduction to relevant portions of following Acts – Good agricultural practices [GAP], Good field collection practices [G.F.C.P.] and Good storage practices [G.S.P.] Drugs and Cosmetic Act, Drug & Magic Remedies Act, FSSA (Food Safety and Standard Acts), AFA(Agriculture, Fisheries and Food Authority), Wildlife & Biodiversity Acts & Intellectual Property Right (IPR) and Regulations pertaining to Import and Export of Ayurvedic Drugs. | 5 |
| 16. | Bio- diversity- Knowledge of biodiversity, endangered medicinal species, threatened species | 2 |

2.7 Rog nidan and Vikriti vigyan

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | Concept of Vyadhi and its principal of classification. Concept of Anukta Vyadhi Nidan | 06 |
| 2. | Knowledge of Doshagati, Vyadhimarga, Vyadhiavastha and its application | 06 |
| 3. | Concept of Agni, Ama and its application | 06 |
| 4. | Concept of Srotas, its role in production of disease and its application | 06 |
| 5. | Concept of Vyadhi Hetu and its classification | 06 |
| 6. | Concept of Oja, Ojadusthi. Concept of Vyadhikshamatwa, Janapadodhwansa in Ayurved and its application in modern times | 06 |
| 7. | Rogapariksha (Nidan Panchak) and its application | 06 |
| 8. | Different methods of Rogipariksha and its application | 06 |
| 9. | Krimivigyan in Ayurved | 06 |
| 10. | Concept of Geriatrics in Ayurved and geriatric disorders | 06 |

2.8 Swasthvrutta

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Concept of holistic health <ul style="list-style-type: none"> • According to Ayurveda. • Spectrum of health, Iceberg phenomenon of diseases, dimensions of health. | 02 |
| 2. | Applied aspect of Dinacharya and Ritucharya <ul style="list-style-type: none"> • Probable Physiologic effect of Dinacharyaprocedures. • Ritu pattern in various countries of the world and Changing environment and application of ritucharya concept. | 04 |
| 3. | Effect of ritus on health and preventive measures. <ol style="list-style-type: none"> 1. Ahara. 1. Concepts of Diet Ayurveda perceptive and its applied aspect. 2. Staple diet of various States of India. Staple diet of various countries in correlation with their climate and its study from ayurvedAaharperceptive. | 04 |
| 4. | Concept ofRasayana, vajikarana and its role inSwasthvrutta. <ul style="list-style-type: none"> • AcharaRasayana, Nityarasayana. • Rasayana procedures for Swastha. • Vajeekarana for Swastha. | 02 |
| 5. | Concept of Vegas, types and the physiology behind each vega and vegadharana | 02 |
| 6. | Concept of Trayopasthambha, and its role in Swasthvrutta. | 01 |
| 7. | Occupational Health. Ergonomics. Role of Ayurveda in it | 01 |
| 8. | Vyadhikshamatva – <ul style="list-style-type: none"> • Modern and Ayurvedic concepts. • Immunization programmes. Possible contribution of Ayurveda. | 06 |
| 9. | Concept of community health. <ul style="list-style-type: none"> • Ecology and community health. | 10 |

| | | |
|-----|--|----|
| | <ul style="list-style-type: none"> • Environment and community health. • Disposal of Wastes- Refuse, Sewage, bio medical waste management. | |
| 10. | <p>Concept of Epidemiology.</p> <ul style="list-style-type: none"> • Critical evaluation of Janapadodhwamsa. • Epidemiology of different Communicable diseases in detail. • Control of Epidemics. | 10 |
| 11. | <ul style="list-style-type: none"> • Demography and Family Planning. • Family Welfare Programme and the role of Ayurveda in it. | 08 |
| 12. | <p>National Health Programmes in Contribution of Ayurveda in National Health Programmes.</p> <ul style="list-style-type: none"> • Health administration under Ministry of H & FWD 15, AYUSH, NRHM, NUHM administration, functions and programmes. • Statistics related with Infectious diseases at International, National and State levels. • Vital Statistics. | 02 |
| 13. | <p>Yoga and Naturopathy.</p> <ul style="list-style-type: none"> • History and evolution of Yoga. • Different Schools of Yoga. • Physiological effect of Yoga on Body and mind – Ancient and modern concepts. • Therapeutic effect of yogic practice in the following. diseases - Diabetes, Hypertension, Cardiovascular disorders, Obesity, Asthma, Piles, Irritable Bowel Syndrome, Eczema, Psoriasis, Stress Disorders, Eye disorders, Head Ache, Juvenile Delinquency, Mental retardation, Depression, Neurosis, Sexual Dysfunction, Uterine Disorders, Cancer. • Basic Principles of Indian School of Nature Cure | 08 |

2.9

Kayachikitsa

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Basic Principles in clinical research of KAYACHIKITSA. Ayurvedic research methodology according to CharakVimanSthana, | 15 |
| 2 | Rasayan – Role and advances of rasayan in present scenario Vajikaran. a) Types b) Drugs used c) Uses d) Clinical significance | 15 |
| 3 | ChikitsaSiddhanta in charaksanhita and sushrutsanhita Shadividhopkram& their importance. a) Langhan b) Bruhan c) Rukshan d) Snehan e) Swedan f) Stambhan | 15 |
| 4 | Routs of Ayurvedic drug administration. a) Internal – Oral, Nasya, Basti, Vaman, Virechan. b) External – Abhyanga, Lepa, RaktaMokshan Ayurveda and national health programs. | 15 |

2.10

Panchakarma

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|----------------|---|--------------|
| 1. | Recent advances in Panchakarma and its instruments with Scope of researches in Panchakarma. | 5 |
| 2. | Importance of Poorvakarma in Shodhana Chikitsa. And various safety precautions related NABH | 5 |
| 3. | Vividha Rogeshu Vamanasyaupayogita with classical and recent advances. | 8 |
| 4. | Vividha Rogeshu Virechanasyaupayogita with classical and recent advances. | 8 |
| 5. | Vividha Rogeshu Bastiupayogita with classical and recent advances. | 4 |
| 6. | Vividha Rogeshu Nasyaupayogita with classical and recent advances. | 6 |
| 7. | Vividha Rogeshu Raktamokshanasyaupayogita with classical and recent advances. | 6 |
| 8. | Agnikarma , Ksharkarma and Viddhakarma | 4 |
| 9. | Various allied Panchakarma Therapies. | 4 |
| 10. | Role of Pashchatakarma. | 2 |
| 11. | Various aseptic precautions and care taken during Panchakarma procedures in present Era. | 2 |
| 12. | Basic principle of Physiotherapy. | 2 |
| 13. | Various instruments of Physiotherapy with Uses and Applications. | 4 |

2.11 Striro roga and Prasuti tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| No | Topic | Hours |
|----|---|----------|
| 1 | Grbha Garbhini Vigyan Recent advances in garbha-garbhini Recent Researches related to above subject | 15 hours |
| 2 | Prasuti tantra Recent advances in prasutitantra Recent Researches related to above subject | 15 hours |
| 3 | Streerog Recent advances in streerog Recent Researches related to above subject | 15 hours |
| 4 | Prasutitantrs evan Streerog shashtrakarma Recent advances in surgery Recent Researches related to above subject | 15 hours |

2.12 Kaumarbhritya tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| Sr. No. | Topics | Hours |
|---------|---|-------------|
| 1. | <p>Development of Kaumarbhrityatantra including ancient and modern literature. Strength of Ayurveda specific to child health care.</p> <p>Ayurvedic consideration of physiology and pathology of Dosha, Dhatu, Mala, Oja, Agni, Prakriti (sharirika-manasika), Kaya and Dhatuposhana in children.</p> <p>Basic Concepts of growth and development, and its assessment.</p> <p>Childhood Samskara and its scientific applications</p> <p>Principles of Child Psychology (Ayurvedic & modern concepts)</p> <p>Concept of BalaRasayana and its application in physical and mental health of children.</p> <p>Concept of Vyadhi-KshamatvaavamVardhanopaya. Concept of immunity and immune enhancing measures.</p> <p>Concept of Dhupana and Raksha karma and their clinical application in pediatric practice</p> | 15 Hours |
| 2. | <p>Fundamentals of Ayurvedic treatment for childhood disorders.</p> <p>Applied pharmacological considerations: Ayurvedic and modern concepts of drug doses, administration, distribution, metabolism, excretion, and other important factors of consideration.</p> <p>Basic concepts of single drugs commonly used in pediatric practice with special reference to their karma</p> | 15 Hours |

| | | |
|----|---|-------------|
| | Kuposhanjanyaand ChayapachayaJanyaVyadhi | |
| 3. | <p>Specific considerations in research methods related to Pediatrics.Update knowledge of clinical pediatrics including recent researches in Kaumarbhritya.</p> <p>Regulatory laws related to child health management.</p> <p>Pediatric disabilities and Rehabilitation</p> <p>Fundamentals of Hospital management with special emphases on Pediatric Ward.</p> <p>Stanyadosha (Vitiation of Breast milk), StanyaShodhana (Purification of breast milk), StanyaJanana and Vardhanopakrama (Methods to enhance breast milk formation)</p> <p>Dhatri (Wet nurse) DhatriGuna and Dosha (Characteristics of Wet nurse), Concept of Breast Milk Banking.</p> <p>Specific Feeding methodology as per Ayurveda and recent advances for NavjatShishu</p> | 15 Hours |
| 4. | <p>Significant contributions of Kashyapasamhita, ArogyarakshaKalpadrum and other texts /treatises of Ayurveda such as HaritaSamhitain the field of Kaumarbhritya including relevant parts from Brihatrai</p> <p>Panchakarma: Principles of Panchakarma [Swedan–Hasta–Pataswedaetc], and their application in pediatric practice in detail.</p> <p>Balagraha: Scientific study of GrahaRogs</p> <p>YajjahPurushiya and Atulyagotriyaadhyaya of Charaka Samhita and applications related to it</p> <p>Measures for obtaining good progeny.</p> | 15 Hours |

2.13 Shalya tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| SR.NO. | TOPIC | HOURS |
|--------|--|-------|
| 1. | Sushruta Samhita | 01 |
| 2. | Sushruta Samhita commentaries | 01 |
| 3. | Tridosha vichara with special emphasis on Rakta as a Chaturtha Dosha | 02 |
| 4. | Chaturvidha Upakrama | 03 |
| 5. | Trividha Karma | 04 |
| 6. | Ashtavidha Shastrakarma | 04 |
| 7. | Basic principles of imaging techniques | 03 |
| 8. | Basic principles of anesthesia | 04 |
| 9. | Principles of management of Bhagna (Fractures) | 03 |
| 10. | Principles of management of acute abdomen | 02 |
| 11. | Principles of plastic and reconstructive surgery | 02 |
| 12. | Vranitopkrama & Vranitagara (Modern concept) | 01 |
| 13. | Marma vichara | 02 |
| 14. | Pathya Kalpana in Shalya | 01 |
| 15. | Specialities and contribution of Ayurveda in Shalyakarma | 02 |
| 16. | Recent advances in surgery | 05 |
| 17. | Special management of immune compromised patients (surgical perspective) | 02 |
| 18. | Special management of COVID 19 patients (surgical perspective) | 01 |

2.14 Shalakya tantra

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

NERTA

| Sr. No. | Topics | Hours |
|---------|--|-------|
| 1. | Applied anatomy and physiology of eye | 04 |
| 2. | Ocular pharmacology and roots of drug administration in ocular diseases, Kriyakalpas | 05 |
| 3 | Blindness- national program | 04 |
| 4 | Eye donation and Keratoplasty | 03 |
| 5 | Yantara – shastra. Diagnostic tools in Shalakyatanya (eye) | 05 |
| 6 | Panchakarma in Shalakyatantra | 05 |
| 7 | Anaesthesia in shalakyatantra (eye) | 04 |

KARNA NASA MUKHAROGA

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Applied anatomy and physiology of E.N.T. | 06 |
| 2 | Pharmacology in ENT and roots of drug administration in ENT diseases, Kriyakalpas | 04 |
| 3 | Deafness and tinnitus | 03 |
| 4 | Hearing Aids | 03 |
| 5 | Yantara – shastra. Diagnostic tools in Shalakyatanya (ENT) | 05 |
| 6 | Panchakarma in Shalakyatantra (ENT) | 04 |
| 7 | Anaesthesia in shalakyatantra (ENT) | 05 |

Paper III- Presentations

Literature survey and the review of the work done earlier on the topic of research presentation.

100 marks

Reviewing of Published research work in area of Ph.D. topic will be a continuous process.

Evaluation and Assessment

1. The Examination for each paper will be of 100 marks with three hour duration.
2. The 3rd paper 'Reviewing of published Research' will be assessed based on the seminar to be given during the semester.
 - For paper third scholar has to give two presentations based on literature survey which will carry 50 marks each.
 - First presentation will be conducted by Research centre and the second presentation will be conducted in the presence of an external examiner and other the only presentation before Examiners.
3. Candidate should have secured 50 marks in each paper for passing.
4. No any practical examination for paper one and paper two, only theory examination will be conducted.
5. The result of the student shall be announced as pass or fail only.
6. If the student fails in one paper in Pre – Ph.D course Examination then he / she can allow to keep the term.

Ph.D. Coursework
Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| Practical | |
| <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
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8. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

Syllabus for Course work for
Ph. D. Environment Science and Technology
Faculty of Science

Effective from 2023 onwards

Institute of Environment Education and Research
Bharati Vidyapeeth Deemed University, Pune

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (INDIA)

Faculty of Science: Doctor of Philosophy (Ph.D.)

Syllabus for Ph.D. Course Work for Subjects under the Faculty of Science (Environment Science)

Course work Detail

Nature of the Course

The course work will consist of FOUR papers, the details of which are given below. All the four papers are compulsory. The duration of the course work will be of one semester.

| | | |
|--|---|-----------|
| Paper I | Research Methodology | 4 credits |
| Paper II | Recent advances in Environment Science | 4 credits |
| Paper III | Research and Publication Ethics | 2 credits |
| Paper III | Review of Literature on the proposed work In the form of presentations a) Presentation on review of literature - 2 credits b) Presentation on the area of research - 2 credits | 2 credits |
| Total – 12 credits (One credit being equivalent to 15 clock hours) | | |

Paper 2- Recent Advances in Environment Science and Technology

(Students can select any TWO units depending on their field of study)

| Unit | Topics | Hours |
|------|--|-------|
| 1 | <p>Biological Assessment Techniques</p> <ul style="list-style-type: none"> • Sampling techniques for vegetation using quadrat and transect (use of software) • Animal Census Technique- direct and indirect methods (use of software) • Animal Acoustic studies (use of software) • Ecosystem evaluation techniques • Genetic Studies • Field data collection methods | (30) |
| 2 | <p>Qualitative Assessment Techniques</p> <ul style="list-style-type: none"> • Field data collection methods • Questionnaire Survey • Semi structured interviews • Conversational interviews • Focus group discussions • Descriptive data analysis technique • PRA Techniques • Documentary analysis | (30) |
| 3 | <p>Mapping Techniques</p> <p>Annotation of SOI topographical maps (with reference to numbering, scales, grid reference, signs and symbols, colour system)</p> <p>Fundamentals of Geographic Information Systems (building spatial and non spatial databases, map making)</p> <p>Use of free open geospatial databases / Data cubes</p> <p>Use of geospatial modelling</p> <p>Mobile based data collection</p> | (30) |
| 4 | <p>Environment Quality Assessment Techniques for water and waste water</p> <ul style="list-style-type: none"> • Physical parameters: Temperature ,Colour, Taste, Odour, Turbidity • solids (TSS< TDS) • Chemical parameters: pH, Conductivity, Hardness, Acidity and Alkalinity, DO, BOD, COD ,Chlorides, Florides, Sulphates, Phosphates Nitrates, Calcium, Magnesium, Sodium, Potassium, Pesticides, Oil and Grease, Sulphide, Phenolic compounds, Heavy metals | (30) |

| | | |
|-----------|---|-------------|
| | <ul style="list-style-type: none"> Biological and Microbiological parameters: MPN, Total coliforms, Faecal coliforms, Isolation of microorganism | |
| 5. | Environment Quality Assessment Techniques for Air and Noise Quality assessment methods <ul style="list-style-type: none"> Meteorological parameter monitoring: Wind speed , Wind direction, Temperature, Relative humidity, Rainfall, Wind rose diagram Pollutant Estimation: Suspended Particulate Matter, Respirable Particulate Matter, Sulphur Dioxide , Oxides of Nitrogen, Hydrogen Sulphide, Ammonia , Hydrocarbons, Volatile Organic Carbons, Odour Measuring noise levels, Leq | (30) |
| 6. | Environment Quality Assessment Techniques for Soil Quality Assessment Methods Particle size distribution, texture, pH, Electrical conductivity, cation exchange capacity, alkali metals, Sodium absorption ratio, Porosity and permeability | (30) |
| 7. | Environment Quality Assessment Techniques for Solid waste assessment methods Per capita generation of solid waste, general segregation into biological/organic/inert/hazardous, loss on heating, pH, Electrical Conductivity , Calorific value ,Metals etc | (30) |
| 8. | Environment Management Techniques Calculating ecological footprint for a given area Impact analysis using various methods Life cycle assessment | (30) |
| 9 | Education / Communication Techniques Education for Sustainable Development Systems thinking Design of educational programs Content analysis of textbooks/ policy documents Design of training programs Techniques for evaluation Behavioural Science Techniques | (30) |

Syllabus for Course work for

Ph. D. Geoinformatics

Faculty of Interdisciplinary Studies

Effective from 2023 onwards

Institute of Environment Education and Research

Bharati Vidyapeeth Deemed University, Pune

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (INDIA)

Faculty of Science: Doctor of Philosophy (Ph.D.)

Syllabus for Ph.D. Course Work for Subjects under the Faculty of

Interdisciplinary Studies

(Geoinformatics)

Course work Detail

Nature of the Course

The course work will consist of FOUR papers, the details of which are given below. All the four papers are compulsory. The duration of the course work will be of one semester.

| | | |
|--|---|-----------|
| Paper I | Research Methodology | 4 credits |
| Paper II | Recent advances in Geoinformatics | 4 credits |
| Paper III | Research and Publication Ethics | 2 credits |
| Paper III | Review of Literature on the proposed work In the form of presentations a) Presentation on review of literature - 2 credits b) Presentation on the area of research - 2 credits | 2 credits |
| Total – 12 credits (One credit being equivalent to 15 clock hours) | | |

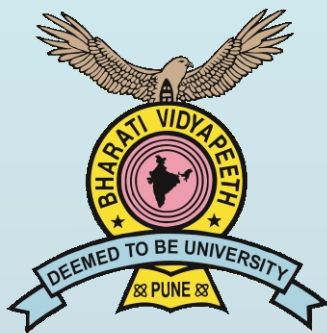
Paper 2- Recent Advances in Geoinformatics

| Unit | Topics | Hours |
|------|--|-------|
| 1 | Mapping Techniques <ul style="list-style-type: none">• Interpretation of SOI maps• Use of open source tools and mobile tools for data collection• Geovisualisation techniques• Advanced mapping techniques | (15) |
| 2 | Techniques in GIS and digital image processing (COTS and Open source software) <ul style="list-style-type: none">• Using the analysis tools in ArcGIS/QGS• Performing multicriteria analysis• Object based classification• AI/ML based classification techniques.• Use of Google Earth Engine for analysis• Use of PostgreSQL and PostGIS for geospatial databases | (15) |
| 3 | Geospatial Modelling <ul style="list-style-type: none">• Basic concepts of modeling• Ecological Modeling• Vector based modeling• Land change modeling• Species modeling• Meteorological Modeling• Use of various modelling software | (15) |
| 4 | Programming for GIS <ul style="list-style-type: none">• Overview of Python programming• Running python scripts• Automating scripts• Using ArcGIS API for Python• Automating map production | (15) |



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE**

**Faculty of Pharmaceutical Sciences
Ph.D
Old Syllabus**



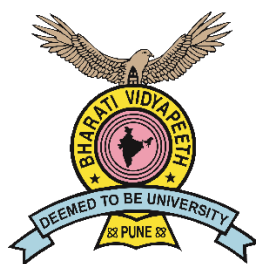
BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

A GRADE AWARDED BY GOVT OF INDIA
A+ GRADE REACCREDITATION BY NAAC

**Faculty of Pharmaceutical Sciences
Doctor of Pharmacy
Ph.D.**

PROGRAMME STRUCTURE & SYLLABUS

**w.e.f. 2017-18
Ph.D. 2017-18**



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

‘A’ GRADE AWARDED BY GOVT OF INDIA

‘A+’ GRADE REACCREDITATION BY NAAC

Faculty of Pharmaceutical Sciences

Doctor of Pharmacy

Ph.D.

Programme Structure and Syllabus

w.e.f. 2017-18

Pharm D. 2017-18

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in **RESEARCH METHODOLOGY**

2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|----------------|--|------------------------|
| 1 | Meaning of research, purpose of research, types of research (educational, clinical, experimental historical descriptive, basic applied and patent oriented research)-objectives of research. Literature survey: use of library, books and journals-medline-internet, getting patients and reprints of articles as source for literature survey. Selecting a problem and preparing research proposal for different types of research mentioned above. | 08 |
| 2 | Methods and tools used in research. Qualitative studies, quantitative studies. Sample data organization, descriptive data analysis. Limitation and source of error. Technical report writing/ paper writing/ thesis writing Plagiarism. | 06 |
| 3 | Guidelines and techniques for experiments with animals. Regulatory bodies like CPCSEA, BS, OECD, LD50, ED50 determination, bioassays, handling of biological waste, handling of radioactive materials. Bioscreening of antihypertensives, antipsychotics, antiarrhythmics, analgesics, anti-inflammatory drugs: | 08 |
| 4 | Biostatistics: Standard deviation, probability distribution, binomial polynomial distribution, continuous data distribution, linear regression and correlation, significance of correlation and regression, parametric tests, testing hypothesis, types of error, test of significance for correlation coefficient. | 08 |

REFERENCES

1. C.R. Kothari, 2004. "Research Methodology". 2nd Ed. New Age International (p) Limited, Publishers.
2. J.R. Fraenkel, N.E. Wallen, 2008. "How to Design and Evaluate Research in Education", 7th Ed. Boston: McGraw-Hill.
3. G. Bordage, B. Dawson, 2003. Experimental study design and grant writing in eight steps and 28 questions. *Medical Education*, 37(4): 376-385.
4. D. Montgomery, 2000. "Design of Experiments". 5th Ed. Wiley Interscience
5. K.P. Willkinson, L. Bhandarkar, "Formulation of Hypothesis". 3rd Ed. Himalaya publishing, Mumbai.
6. Cochran & Cocks, 1957. 2nd Ed. "Experimental Design" New York, John Willy & sons
7. J.W. Best and J.V. Kahn, 2006. "Research in Education". 10th Ed. PHI publication
8. C. B. Gupta, Introduction to Statistical Methods
9. LD Fisher, GV Belle, Biostatistics: A Methodology for Health Sciences. 2nd Edition. Wiley Interscience .2004
10. Sanford Bolton. Pharmaceutical statistics- Practical and clinical applications. 4th edition, publisher Marcel Dekker Inc. New York.
11. Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London
12. Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York
13. Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work
Advanced Level Course in Pharmaceutics
2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|----------------|--|------------------------|
| 1 | ICH guidelines for stability evaluation | (2hrs) |
| 2 | QbD based formulation development and Statistical Designs for optimization | (3hrs) |
| 3 | Colloidal DDS: Specialized DDS like micro / nano emulsions, SMEDDS, Multiple emulsions, liposomes, niosomes, polymeric micelles and other vesicular DDS: Design, development, issues and consideration. | (3hrs) |
| 4 | Nanoparticulate systems such as lipid nanoparticles and polymeric nanoparticles: Methods of preparation, characterization and applications. | (4 hrs) |
| 5 | Parenteral DDS: Development and evaluation of CR Injectables and implants. | (2 hr) |
| 6 | Peptide and protein based DDS: Chemistry and special features of peptide and protein molecules, stability, analysis, Formulation and evaluation Barriers to peptide and protein delivery; Routes of delivery, Toxicity, immunogenicity, vaccines and gene based DDS. | (4 hr) |
| 7 | Pulmonary DDS – Physiological basis and formulation considerations. Design of Pressurized aerosols, Dry powder DDS, Devices for administration and evaluation. | (3hr) |
| 8 | Targeted DDS: Concept of drug targeting, need for drug targeting, basis for drug targeting both active and passive. Ligands for targeted delivery, Monoclonal antibodies in targeted delivery, design of targeted DDS for cancer and infectious diseases, Brain and Colon targeting approaches and DDS | (3hr) |
| 9 | In vitro / ex vivo models for evaluation of Drug absorption. | (2Hr) |
| 10 | Toxicity testing: In vitro toxicity testing and its application to safety | (2hrs) |

| | | |
|--|--|--|
| | <p>evaluation, General perspectives, in vitro toxicity trends and issue, Ocular and cutaneous irritation, Validation of in vitro toxicity tests. Acute, sub-acute and chronic toxicity testing – Biochemical basis of toxicity, Design of toxicological studies, Quality assurance in toxicology studies, Toxicity by routes – Parental, oral, percutaneous and inhalation, Target organ toxicity exemplified by hepatotoxicity and cutaneous (dermal) toxicity.</p> | |
|--|--|--|

References

1. Martin, P. Bustamante and A.H. Chun; Physical Pharmacy; Waverly
2. M.N. Rubinstein, Pharmaceutical Technology, Drug Stability, John Wiley and Sons
3. P.H. List and P.C. Schmidt; Pharmaceutical technology, CRS press.
4. Robinson, Novel Drug Delivery System, Marcel Dekker.
5. Morton Rosoff, Controlled release of drugs, VCH Publishers
6. N.K. Jain, Controlled and Novel Drug delivery, CBS Publisher, New Delhi.
7. P. Johnson and J.G. Lloyd – Jones, Drug Delivery Systems, VCH Publisher
8. Bolton S; Pharmaceutical statistics; Marcel Dekker
9. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glphandbook.pdf>).
10. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, Ministry of Health and Family Welfare (department of health) New Delhi
11. Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Pharmaceutical Chemistry

2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|---------|---|-----------------|
| 1 | Advanced Analytical Techniques: Applications of IR, NMR, Mass Spectrometry, HPLC, HPTLC, GC-MS, LCMS and LC-MS-MS. | (5hrs) |
| 2 | Design and Application of Prodrugs concept: a) Prodrug concept, hard and soft drugs b) Classification of prodrugs. c) Prodrugs of various functional groups like carbonyl, hydroxy, amide, amines. d) Application of prodrug approach to: Pharmaceutical, Pharmacokinetic and Pharmacodynamic applications. e) Limitations and drawbacks of prodrug concept f) Macromolecular prodrugs | (5hrs) |
| 3 | Combinatorial Chemistry: Combinatorial approaches, Chemical Peptide and small molecule libraries; Applications, methodology, Combinatorial Organic Synthesis, deconvolutions, Assays and Screening of Combinatorial libraries, Introduction to High Throughputs Screening (HTS) | (5hrs) |
| 4 | Drug Discovery: Drug Discovery Strategies in Direct Drug Design (Structure based) and Indirect drug design, Target selection and lead Identification. | (3hrs) |
| 5 | Protection-deportation: Of aldehydes, ketones, hydroxyl, carboxyl and amino groups. | (3hrs) |
| 6 | QSAR: a) Parameters - Lipophilicity, electronic, steric factors | (4hrs) |

| | | |
|---|--|--------|
| | b) Quantitative Models - i) Hansch analysis ii) Free Wilson Analysis iii) Mixed approach c) Other QSAR Approaches d) Applications of Hansch Analysis, Free Wilson Analysis. | |
| 7 | Molecular Modelling in Drug Design: Introduction to Molecular Modelling: Concepts and Methods, Molecular Mechanics - force fields (Potential energy function), Energy Minimization Methods - Steepest, descent, Conjugate gradients, Newton methods (Non mathematical), Conformational Analysis, Systematic search, Monte carlo simulations, Molecular dynamics simulations, Ligand design based on 3D structure of receptor/enzyme. | (5hrs) |

RECOMMENDED BOOKS:

1. Silverstein, Basseler, Morrill - Spectrometric identification of organic compounds (John Wiley and Sons, N.Y.)
2. J.R.Dyer - applications of Absorption Spectroscopy of Organic compounds (Prentice Hall, London)
3. C.N.R.Rao - Chemical applications of Infra-red spectroscopy (Academic press, N.Y.)
4. R.J. Hamilton-Introduction to High Performance Liquid chromatography, (Chapman and Hall, London)
5. Burger: Medicinal Chemistry (John Wiley & Sons N.Y.)
6. Foye: Principles of Medicinal Chemistry (Varghese & Co.)
7. Lednicher: Organic Drug Synthesis Vol. 1, 2, 3, 4 (John Wiley & Sons N.Y.)
8. Ariens: Medicinal Chemistry Series
9. Ellis and West: Progress in Medicinal Chemistry Series
10. Butterworth: Progress in Medicinal Chemistry Series
11. Wilson and Gisvold - Text book of Medicinal Chemistry (J.B. Lippincott cam)
12. Comprehensive Medicinal Chemistry - Series -I-VI (Elsevier Pergamon) by Corwin Hansch, Peter G.Sammes and John B. Taylor.
13. Contemporary Drug synthesis (wiley Interscience) by Jie-Jac Li, Douglas S.Jhonson, Drago R. Silskoric and Bruce D. Roth.

14. The Practice of Medicinal Chemistry (Academic Press, Elsevier), 2nd Edition by Camille G. Wermuth
15. Synthesis of Drug, A synthon approach by Radhakrishnan P. Iyer & Anant v. prabhu, 1st Edition, (1985) Sevak Publications, Mumbai
16. Hugo Kubingi - QSAR, Hansch Analysis and Related Approaches Vol.1

RECOMMENDED BOOKS:

- 1) Skoog: Principles of Instrumental Analysis (Saunders College Publishing Philadelphia)
- 2) M.Orchin and H.H.Jaffe - Theory and applications of ultra violet spectroscopy (John Wiley and Sons, N.Y.)
- 3) Willard, Merritt, Dean - Instrumental Methods of Analysis (CBS Publishers and Distributors, Delhi)
- 4) Higuchi: Instrumental Methods of Analysis
- 5) Analytical Chemistry by open learning series
- 6) Ewing–Instrumental Methods of Chemical Analysis (McGraw Hill Book Co. New York)

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Pharmacology

2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|----------------|---|------------------------|
| 1 | Care, handling and breeding techniques of laboratory animals. CPCSEA guidelines OECD guidelines, Preparation of Form B | (2 hrs) |
| 2 | Preclinical Screening of drugs using recent evaluation techniques Transgenic animals: Production, maintenance and applications, Microdialysis, highthroughput screening, radioligand binding assay, patch clamp technique, Immunohistochemistry, Immunoassays | (5 hrs) |
| 3 | Molecular mechanism of drug action Receptor occupancy and cellular signalling systems such as Gproteins, cyclic nucleotides, calcium and phosphatidyl inositol. Ionic channels and their modulators. Secondary messengers. | (5 hrs) |
| 4 | Screening of Drugs used in treatment of Drugs for neurodegenerative diseases like Alzheimers and multiple Sclerosis Reproductive Pharmacology: Aphrodisiacs and antifertility agents Anti-cancer agents Immunomodulators, Immunosuppressants and immunostimulants | (5 hrs) |
| 5 | Regulatory Studies on Toxicity Studies Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies Extrapolation of in vitro data to preclinical and preclinical to humans Toxicokinetics- Toxicokinetic evaluation in | (5 hrs) |

| | | |
|---|--|---------|
| | preclinical studies, saturation kinetics Importance and applications of toxicokinetic studies. Alternative methods to animal toxicity testing. | |
| 6 | Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting Genetic variation and its role in health/ pharmacology | (3 hrs) |
| 7 | Concept of clinical research Ethics, organization and phases of clinical trials | (1 hr) |
| 8 | Safety pharmacology studies Origin, concepts and importance of safety pharmacology. Tier1-CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies. | (4 hrs) |

References:

1. Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990
2. Goodman and Gilman's; The pharmacological basis of therapeutics Ed. Brunton L., Chamber B., Knollman B., 12th edition, McGraw Hill, New York, 2011.
3. Katzung B. G., Masters S. B. and Trevor A. J.; Basic and Clinical pharmacology, 11th edition, Lange Tata McGraw Hill edition, 2009.
4. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glphandbook.pdf>).
5. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, Ministry of Health and Family Welfare (department of health) New Delhi
6. Rang and Dale's Pharmacology, Churchill Livingstone, 6th edition, 2007.
7. Sheth U. K., Dadkar N. K. and Kamat U. G.; Selected topics in experimental pharmacology, Kothari Book Depot, Mumbai.
8. Lawrence D. R. and Bacharch A. L.; Evaluation of Drug Activities, Pharmacometrics, Academic Press.
9. Kulkarni S. K.; Handbook of experimental pharmacology, Vallabh Prakashan, New Delhi.

10. Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London
11. Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York.
12. Oxford Textbook of Medicine, 3rd edition, Vol. I, II, III. Ed. Weatherall D. J. Ledingham G. G., Warrell D.A., Oxford medical publications, 1996
13. Walker R., Edward C.; Clinical pharmacy and therapeutics, 3rd edition, Churchill, Livingstone, London, 2003
14. Laurence D. R., Benett P. N.; Clinical Pharmacology, 6th edition, Churchill, Livingstone, 1987.
15. Turner R. A.; Screening methods in pharmacology, 2011, Academic press, London
16. Vogel H. G. and Vogel W. H.; Drug discovery and evaluation, Pharmacological Assays, 3rd edition, Springer, New York.
17. Thomson E. B.; Drug Bioscreening: Drug evaluation techniques in pharmacology, VCH publishes USA, 1990

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE**Advanced Level Course in PHARMACOGNOSY 2017**

| Sr. No. | Topic | No. of Lectures |
|----------------|---|------------------------|
| 1 | Phytochemical screening of crude drugs: Extraction, isolation, purification, characterization of following phytoconstituents. Alkaloids: Caffeine, Atropine, Ergometrine Glycosides: Digoxin, Sennosides Flavonoids: Rutin, Quercetin Terpenoids: Clove oil Saponins: Glycyrrhizitic acid, Diosgenin | 04 |
| 2 | Plant Extracts, Preparation and standardization of Phytopharmaceuticals <i>Withania somnifera, Tinospora cardifolia, Curcuma longa, Solanum xanthocarpum, Ocimum sanctum, Tribulus terrestris, Adhatoda vasica, Emblica officinalis, Centella asiatica, Azadirachta indica</i> | 03 |
| 3 | Quality control of herbal drugs as per WHO guidelines | 03 |
| 4 | Application of various Chromatographic and Spectrometric techniques like TLC, CC, GLC, HPLC, HPTLC, UV, IR, NMR, MS, Flash Chromatography etc. for standardization of plant drugs. | 03 |
| 5 | Plant Tissue Culture Introduction, Techniques of initiation and maintenance of various types of cultures, Static, Suspension and hairy root cultures, Immobilization of plant cells, Biotransformation, Bioreactors for production of phytoconstituents and strategies for enhanced production of phyto-constituents. | 04 |
| 6 | Traditional systems of medicines and drug formulations of Ayurveda, Siddha, Unani, Homeopathy, TCM (Traditional Chinese Medicine) | 03 |
| 7 | Brief introduction to Pharmacological Screening Methods with example of following category of medicinal herbs. Hepatoprotectives, Antidiabetics, Antioxidants, Anti-inflammatory, | 04 |

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| | Analgesics, Immunomodulatory activities | |
| 8 | Herbal Drug Regulations affairs | 02 |
| 9 | Marine drugs and their discovery | 02 |
| 10 | Herbal cosmetics and Herbal drug formulations Ingredients used in various products such as creams, powders, lotions, hair products, nail polishes, lipsticks and toiletries etc. and their analysis. | 02 |

REFERENCES

1. Mukherjee Pulok, Quality Control of Herbal Drugs, Business Horizons Limited, New Delhi.
2. Advances in Natural Product Chemistry, extraction and isolation of biologically active compounds. S. Natori et al., Wiley, New York.
3. Phytochemical Methods by J.B. Harborne, Chapman and Hall, International Ed., London.
4. Modern methods of plant analysis by Peach and Tracey, Vol. II, IV, Springer Verlag.
5. G.E. Trease and W.C. Evans., Pharmacognosy, W.B. Saunders Co. Ltd., Harcourt Publishers Ltd. UK.
6. Quality Control Methods for medicinal plant material, WHO Geneva.
7. Wagner H, Blatt S, 1996. Plant Drug Analysis- A Thin Layer Chromatography Atlas, 2nd Ed., Springer-Verlag, Berlin.
8. Stahl Egon, Thin layer chromatography, 2nd Edition, Springer Publication.
9. Mukherjee PK, 2003. GMP for Indian system of medicine. In GMP for Botanicals. Verpoorte R, Mukherjee PK (Edn.), Business Horizons Limited, New Delhi.
10. Herbal Drug technology by SS Agrawal and M Paridhavi, Orient Longman
11. Indian Herbal Pharmacopoeia, Vol. I- II, SS Handa, RRL Jammu Tawi, and IDMA Mumbai.
12. The Aurvedic Pharmacopoeia of India, 1999. Government of India, Ministry of Health and Family Welfare, Department of Indian Systems of Medicine and Homeopathy, New Delhi.
13. Standardization of Botanicals by V. Rajpal, Vol. I and Vol II, Eastern Publishers, New Delhi.

14. Houghton P, Mukherjee PK. Evaluation of Herbal Medicinal Product, Pharmaceutical Press, London, 2009.
15. Nutraceuticals by Lisa Rapport and Brian Lockwood.
16. Pharmacognosy by CK Kokate, APPurohit and SB Gokhale, Nirali Prakashan, Pune
17. Pharmacognosy by VD Rangari, Career Publications, Nasik
18. Medicinal Plant Biotechnology by A G Namdeo, Career Publications, Nasik.
19. Quality Standards of Indian Medicinal Plants Vol. I- V, Indian Council of Medical Research, New Delhi.
20. Marine Pharmacognosy by DF Martin and GM Padilla, Academic Press.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Ph.D. Course Work

Advanced Level Course in Pharmaceutical Biotechnology 2017

| Sr. No. | Topic | No. of Lectures |
|----------------|---|------------------------|
| 1 | <p>Understanding Molecular and genetic mechanisms, Genes and Chromosomes</p> <p>Chromosomal organization and morphology in eukaryotes and prokaryotes-exons and introns, mobile and organelle DNAs, nucleosome-structure and spatial organization histones- transposons Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; Cohesive and blunt end ligation; Linkers; Adaptors; Labeling of DNA: Hybridization techniques: Northern, Southern and Colony hybridization, Fluorescence in situ hybridization; DNA-Protein Interactions-Electromobility shift assay.</p> | (5Hrs) |
| 2 | <p>Genetic Engineering</p> <p>Cloning Vectors: Plasmids; Bacteriophages; M13 vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/baculo & retroviral vectors; Expression vectors; pMal; GST; pET-can be omitted vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; Methodologies to reduce formation of inclusion bodies; Baculovirus and pichia vectors system. Expression cloning; Yeast two hybrid system; Phage display; PCR: Primer design; Taq DNA polymerases; Proof reading enzymes; Types of PCR – multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products; PCR in molecular diagnostics.</p> | (5 Hrs) |

| | | |
|---|--|---------|
| 3 | <p>Applications of Genetic Engineering</p> <p>Site specific mutagenesis; production of recombinant insulin, rDNA technology for the production of therapeutic proteins, Blood products: Erythropoietin, human serum albumin, Recombinant vaccine: Hepatitis B surface antigen, Regulatory proteins: growth hormones, interferon, Stability of rDNA products.</p> | (5 Hrs) |
| 4 | <p>Enzyme technology and Bioprocess Engineering:</p> <p>Enzyme sources, techniques in extraction and purification, Enzyme stability and Kinetics, effects of pH, temperature, ionic concentrations on enzyme activity. Applications and immobilization techniques, Kinetics of cell/microbial growth, substrate utilization and product formation; Simple structured models; Sterilization of air and media; Batch, fed batch and continuous processes; Aeration and agitation; Mass transfer in bioreactors; Rheology of fermentation fluids; Scale-up concepts; Design of fermentation media; Various types of microbial and enzyme reactors; Instrumentation in bioreactors.</p> | (5 Hrs) |
| 5 | <p>Omics, Pharmacogenomics, and bioinformatics.</p> <p>Introduction, Biological macromolecules databases and search tools: computational tools and databases, Database mining tools, Computational tools for DNA sequence analysis, Genome analysis, Functional genomics and Proteome analysis.</p> <p>Overview and advances in Pharmacogenomics, Pharmacokinetics and Proteomics. –, Molecular markers, sequencing, Next gene sequencing, microarray technology etc. Role of pharmacogenetics and pharmacogenomics in Drug metabolism and in optimizing individualised drug therapy.</p> | (5 Hrs) |
| 6 | <p>Advanced tools in biotechnology</p> <p>Animal tissue culture, their pharmaceutical applications, Monoclonal antibody production and protoplast fusion. A detailed study on the theory, instrumentation and applications of following techniques viz., PCR, Electrophoresis, Blotting techniques, Real-time PCR, Flow Cytometry, ELISA, RNAi mediated gene silencing.</p> | (5 Hrs) |

References:

1. Elements of Biotechnology by P.K. Gupta.
2. Pharmaceutical Biotechnology, Vyas, CBS, Delhi.
3. J. Kubey, Immunology – an Introduction, 2004.
4. E. Benjamini, Molecular Immunology, 2002.
5. Arthur M. Lesk, Introduction to Bioinformatics (2002), Oxford University Press.
6. Text Book of Biotechnology by R.C. Dubey.
7. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
8. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi
9. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Quality Assurance Techniques 2017

2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|---------|--|-----------------|
| 1 | i) ICH Guidelines: Introduction and detailed study of Q7, Q8, Q9, Q10, Q11 ICH guidelines. ii) Quality by Design: Basic principles and applications of QbD in pharmaceutical formulation development. iii) Current Good Laboratory Practices | (6 hr) |
| 2 | Pharmaceutical Validation: i) Introduction and Concepts: DQ, IQ, OQ and PQ; Prospective validation, retrospective validation, concurrent and revalidation; Validation master plan and Calibration master plan. ii) Validation of Equipments with Examples: iii) Utilities Validation: Validation of pharmaceutical water system & pure steam; Validation of HVAC system. iv) Cleaning Validation: Cleaning of equipment; Cleaning of facilities v) Analytical Method Validation: General principles of analytical method validation; vi) Process Validation vii) Computer System Validation | (6 hr) |
| 3 | Quality Planning and Analysis: Basic concepts of quality; Quality control; Quality assurance; Total quality management; Quality in manufacturing; Materials management; Documentation and records. | (5 hr) |
| 4 | Spectroscopic Methods: Theory, principle and instrumentation; Interpretation of data / structure elucidation and pharmaceutical applications of UV, IR, NMR, mass spectrometry with examples. | (4 hr) |

| | | |
|---|---|--------|
| 5 | Separation Techniques: Theory, principle, instrumentation and pharmaceutical applications of GLC, HPLC, HPTLC, GC-MS, LC-MS, LC-MS-MS. | (5 hr) |
| 6 | Pharmaceutical Quality Audits: Plant level department wise documentation and quaternaries; Principle of quality audit; Preparing for FDA inspection of manufacturing site. | (4 hr) |

References:

1. Good Manufacturing Practices by S.H.Wills and J.R.Stoker, Marcker and Dekker incorporations.
2. Good Manufacturing Practices for Pharmaceuticals (6th Edn.) by Joseph D. Nally, Informa Healthcare Publication.
3. Selected International GMP guidelines of various countries like UK, USA, Australia, South Africa.WHO.India. & ICH guide lines.
4. Pharmaceutical process validation by Robert Nash and A.H Wachter, Marcel and Dekker Inc. Vol. 129
5. Validation of pharmaceutical process (sterile products) by F.J Carleton and J.P Agalloco Marcel and Dekker Inc.
6. Quality planning and analysis. By J. M. Juran and F.M. Gryna Tata Mcgraw Hill India. 5th Edition
7. Juran's quality handbook; Juran J.M. and Godfrey A.B. McGraw Hill.
8. Pharmaceutical Quality Assurance by M.A.Potdar Nirali Prakashan, Pune.
9. Skoog: Principles of Instrumental Analysis (Saunders College Publishing Philadelphia)
10. Willard, Merritt, Dean - Instrumental Methods of Analysis (CBS Publishers and Distributors, Delhi).
11. Higuchi: Instrumental Methods of Analysis
12. R.J. Hamilton-Introduction to High Performance Liquid chromatography, (Chapman and Hall, London).
13. ICH Guidelines- Q7, Q8, Q9, Q10, Q11

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Pharmacy Practice

2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|------------|---|-----------------|
| I | CLINICAL PHARMACY PRACTICE | (10 hr) |
| | 1. Introduction: Definition, evolution and scope of clinical Pharmacy | (1 hrs) |
| | 2. <i>Clinical Pharmacy Services</i> : Patient medication history interview, Basic concept of medicine and poison information services, ADR reporting services and causality assessment, Medication errors. | (6 hrs) |
| | 3. <i>Lab Data Interpretation</i> : Tests associated with cardiac disorders, Pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, <i>Hematological tests</i> . | (3 hrs) |
| II | PHARMACOTHERAPEUTICS | (10 hrs) |
| | 1. Etiopathogenesis and pharmacotherapy of diseases associated with following systems: Gastrointestinal system : Peptic ulcer diseases Cardiovascular system : Hypertension, Congestive cardiac failure, Acute coronary syndrome Endocrine system : Diabetes, Thyroid Respiratory system : Asthma and COPD Hematological diseases : Anemia Bone and joint disorders : Rheumatoid arthritis Renal system : Acute renal failure, Chronic renal failure Evidenced based medicines : Concept and applications | |
| III | HOSPITAL PHARMACY SERVICES | (5 hrs) |
| | 1. Procurement & warehousing of drugs and Pharmaceuticals | (1 hrs) |
| | 2. Drug distribution in the hospital <ul style="list-style-type: none">• Individual prescription method• Floor stock method• Unit dose drug distribution method | (1 hrs) |

| | | |
|-----------|---|----------------|
| | 3. Distribution of Narcotic and other controlled substances Hospital drug policy - Pharmacy and Therapeutic committee (PTC), Hospital committees, Infection committee, Research and ethical committee developing therapeutic guidelines, Hospital pharmacy communication – Newsletter | (3 hrs) |
| IV | CLINICAL RESEARCH | (3 hrs) |
| | 1. Good Clinical Practice – ICH GCP personnel and functions | (1 hrs) |
| | 2. Clinical Trials – Types, Different phases, subject enrolment, safety monitoring, ICF | (1 hrs) |
| V | PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS | (2 hrs) |
| | 1. Pharmacoepidemiology: Scope and applications. Types of methodological studies (in brief). | (1 hrs) |
| | 2. Pharmacoeconomics evaluations: types of cost and methods of evaluation (in brief). | (1 hrs) |

References:

1. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
4. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
5. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi et al.
6. Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
7. Williams and Wilkins Publication. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication
8. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
9. Pathologic basis of disease - Robins SL, W.B.Saunders publication
10. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice – Green and Harris, Chapman and Hall publication

11. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
12. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
13. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
14. Hospital pharmacy by William.E. Hassan
15. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh
16. Textbook of Clinical Trials David Machin, Simon Day, Sylvan Green.Wiley Publications.
17. Textbook of Epidemiology – Brian Storm and Stephen E.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE

Syllabus for Course Work

Advanced Level Course in Drug Regulatory Affairs 2019

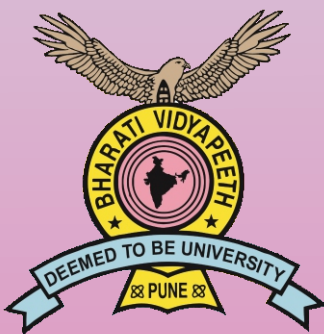
2 Credits (2*15hrs)

| Sr. No. | Topic | No. of Lectures |
|----------------|--|------------------------|
| 1 | Overview of GMP & GLP guidelines with specific reference of WHO, USFDA & India. | (6 hr) |
| 2 | ICH Guidelines , overview of QSEM classification and related guidance. Preparation of CTD Document. | (6 hr) |
| 3 | Drug registration process & types – USFDA, MHRA & India | (5 hr) |
| 4 | Bioequivalence guidelines for in-vitro, in-vivo & clinical trials in US, Europe & India. | (4 hr) |
| 5 | Documentation, Audits & Inspections: Master formula record (MFR), Master formula card (MFC), Batch processing record (BPR), Packaging records, Standard operating procedure (SOP), Site master file, specifications, Certificate of analysis (COA), Material safety data sheet (MSDS), Method of Analysis (MOA), Annual product review, validation protocols, Stability protocol, TLICENSE, forms, maintenance of records in Pharmaceutical industry. | (5 hr) |
| 6 | Quality management systems: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control. | (4 hr) |

References:

1. Willing, Tuckerman and Hitchings, Good Manufacturing Practices for Pharmaceuticals
2. Common Technical documents (ICH guidelines).
3. WHO GMP guidelines
4. Establishing a cGMP Laboratory Audit System, A practical Guide by David M. Bleisner, Wiley Publication.
5. How to practice GLP by PP Sharma, Vandana Publications

6. www.mhra.gov.uk
7. www.who.int
8. www.ich.org
9. <https://cdsco.gov.in>
10. www.fda.gov
11. www.emea.europa.eu



**Bharati Vidyapeeth
(Deemed to be University) Pune, India
Poona College of Pharmacy
Erandwane, Pune - 411 038
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Bharati Vidyapeeth
(Deemed to be University)
College of Architecture, Pune
Doctoral Programme- 2022

Syllabus for Ph. D. Entrance Exam

ARCHITECTURE

NOTE:

The syllabus is based on 5 year B.Arch architecture course prescribed by COA 2017 guidelines. Five questions of 10 Marks each will be asked on the overall syllabus

Section – II

| Unit No. | Syllabus |
|----------|--|
| 1 | <p>BUILDING MATERIALS AND CONSTRUCTION</p> <p>Properties and behavior of both natural and man-made building materials such as bricks, stones, metals, timber, glass, steel and finishing materials in contemporary buildings; Application of these materials in construction; Effects of sun, rain, wind and other climatic and environmental conditions on various building materials and built environment and the science of design for creating effective human comfort conditions within the built environment. understanding of parameters like U-factor, R-value, Thermal mass, Solar heat gain coefficient (SHGC), Visible light transmittance (VLT), etc.</p> <p>Traditional and conventional knowledge systems that enable construction of a complete building; various structural systems and methods of construction and detailing of buildings of medium complexity using natural and manmade materials including foundation, walls, roofs, staircase, joinery, and finishes; Technology that informs the construction of contemporary buildings using various structural systems and materials</p> |
| 2 | <p>CLIMATOLOGY AND BUILDING SERVICES</p> <p>Climatology as a science for the study of weather conditions averaged over a period of time; the elements of climate; study of human comfort; design of solar shading devices; Heat flow through building envelopes; Air movement due to natural and built form; Design strategies in different climate zones; vernacular and contemporary responses to climate, Concept of sustainability and Green buildings.</p> <p>Study of and design and detailing for water supply, drainage, sewage disposal, garbage disposal, electrification, illumination, air conditioning, fire hazard protection, acoustical treatment, rainwater harvesting, etc. in buildings and building premises, disaster management systems, intelligent energy conservation systems, electronic security and surveillance systems for buildings, etc.; compliance requirements w.r.t. National Building Code and Energy Conservation Building Code.</p> <p>Science of sound; conditions for good hearing; appropriate materials for sound insulation; approaches in history for acoustic planning; planning for good hearing conditions in auditoriums, classrooms, churches and halls, conference rooms, etc.</p> |
| 3 | <p>CULTURE, ARCHITECTURE AND HUMAN SETTLEMENT PLANNING</p> |

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|-------------------------------|---|
| | <p>Architecture as evolving within specific cultural contexts including aspects of politics, society, religion, climate; geography and geology, etc. Development of architectural form with reference to Technology, Style and Character. Vernacular architecture as a process and not a product; Determinants of vernacular form; Overview of the various approaches and concepts to the study of vernacular architecture;</p> <p>Urban design as a discipline; Components of a city and their interdependent roles; Determinants of urban form; Evolution of historic urban form.; Theories and illustrations of Urban design and the interpretation of the urban form in different ways and layers; Identity and 'place' making; architectural codes and imageability; contemporary urban issues; sustainable urban design.</p> <p>Elements and characteristics of human settlements; origins; determinants and their evolution through the course of history; Settlements as expression of political aspirations; Various planning concepts in urban, rural and regional level development plans; Housing issues and design typologies.</p> |
| 4 | <p>LANDSCAPE, SITE PLANNING AND ARCHITECTURAL CONSERVATION</p> <p>Man and Nature; Landscape traditions; Elements and principles of landscape design; Aspects of outdoor design and site planning in enhancing and improving the quality of building environs, functionally and aesthetically; Site structure relationship; Analytic, artistic and technical aspects of designing open spaces at different scales; Role of Landscape design in sustainability.</p> <p>Site and its content in architectural creations; Influencing factors which governs the siting of a building or group of buildings in a given site; Topography analysis; Scientific techniques of site analysis- case studies; Methodology of preparing a site analysis diagram and mapping; Codes and building regulations; Site utilities and Infrastructure planning.</p> <p>Various issues and practices of Conservation; values and ethics; status of conservation and the various agencies involved in the field of conservation worldwide and their policies; various guidelines for the preservation, conservation and restoration of buildings; management of historic sites; study of various charters; character and issues in our heritage towns through case studies; Role of INTACH, UNESCO, ICOMOS and other such organization.</p> |
| 5 | <p>ARCHITECTURAL DESIGN AND THEORY</p> <p>The understanding the elements and principles of design as the building blocks of creative design. Principles and percepts of issues as related to architectural design in theory and practice; Appreciation of architecture with respect to man and his behavior; Nature and Design; Principles of organization on Nature; Ideas and Intent in design - Intuitive, contextual, Iconic, Experiential, Environmental, Energy based, Symbolic, Modular; Ideologies/ philosophies from the practice of architecture through contemporary history; design communication through graphics.</p> |
| | |
| Books: Indicative list | |
| 1. | ASHRAE Handbook. |

| | |
|----|---|
| 2. | A Primer on Theory on Architecture by Karen Spence |
| 3. | Rapoport, A. (1969), House Form and Culture, Prentice-Hall, Englewood Cliffs, NJ. |
| 4. | A History of Architecture, Sir Banister Fletcher |
| 5. | Kostof, Spiro, The City Shaped: Urban Patterns and Meanings Through History, Second edition, Thames & Hudson, New York 1999 |
| 6. | Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. McGraw-Hill Professional |
| 7. | Alexander, Christopher, et al. A pattern Language: Towns Buildings, Construction, Oxford 1977 |
| 8 | Manual of tropical housing and building – <i>Koenigsberger et al, Orient Longman, 1973.</i> |
| 9 | Building Construction Handbook by Roy Chudley |
| 10 | Building Services, Technology and Design By <u>Roger Greeno.</u> |

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
College of Architecture
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|------------------------------------|---------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Advances in Architecture | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 08 | 04 |
| 4 | Research and Publication Ethics | 02 | | 30 | 20 | - | 50 | 02 | | 02 |
| Total | | 10 | 08 | 120 | 80 | 150 | 350 | 10 | 08 | 14 |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Ph.D. Course-work Syllabus

Paper-I
Research Methodology

| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
|--------------------------------|---|---------------------------------|
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |

Course Objectives:

- begin to formulate researchable problem in areas of research interest;
- write an effective research proposal or report;
- make appropriate choices about research strategies;
- review literature judiciously and systematically;
- understand and begin to apply the principles of collecting research data;
- understand and begin to conduct appropriate analyses of data;
- make appropriate choices about quantitative methods;
- demonstrate sensitivity to ethical issues raised by researchers;

Topics Covered

| | | |
|----------------|--|------------------|
| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data</p> | (8 Hours) |

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| | collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection. | |
| UNIT-III | Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | (8 Hours) |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication. | (8 Hours) |
| UNIT-VI | Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor. Research Ethics: ethical issues in research, plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights. | (8 Hours) |

Assignments:

| | |
|----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |

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| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| | |

Text Books/References:

| | |
|----|--|
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Discipline: Architecture Ph.D. Course-work Syllabus | | |
| Paper-II Advances in Architecture | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | University Examination : 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> ● Understand the application of visual research methods for architectural research. ● Understanding and interpreting the relationship between values, beliefs and their manifestations in the built environment. ● Understand and analyse various theories and concepts in relation to Architecture, Planning, Urban Design and allied fields ● Apply advance building systems and the Legal aspects in the Architecture Profession. ● Understand Pedagogy and establish its relationship with Architecture ● Know effect of climate change and need for sustainable cities | | |
| Topics Covered | | |
| UNIT-I | Society, Culture, and Architecture <ul style="list-style-type: none"> ● Cultural influences on Architecture. Cultural values and social behaviour and their reflection in shaping traditional spaces and contemporary layouts. Culture, cultural characteristics and importance of culture as a way of life. Cultural reflections in city patterns. ● Material culture (all the physical things that people create and attach meaning to). and nonmaterial culture (creations and abstract ideas that are not embodied in physical objects). Linkage and influence on the built environment. ● Society and Architectural identity. Reflection of societal norms and community principles through spatial and visual elements in the built environment. Society, social behaviour and the social determinants of physical form. ● Human activities and spaces. Society, beliefs, views and built expressions. Influence of ideas, values, beliefs, activities, relationships and forms of the social and spatial organizations that they sustain. | (10 Hours) |
| UNIT-II | Theories and concepts in Architecture and planning <ul style="list-style-type: none"> ● Architecture and Conservation: Descriptive, Explanatory, Normative for e.g Vitruvian, Classical, Personal Styles. Theories related to Conservation, Restoration and Adaptive Reuse | (10 Hours) |

| | | |
|-----------------|---|-------------------|
| | <ul style="list-style-type: none"> ● Planning and Urban Design: Principles of Ekistics; central place theory, concentric zone, gravity and sector model, neighbourhood and walkability concept, System Planning, Participatory planning, Advocacy planning, New urbanist, etc; Theories of Urban Design by Kevin Lynch, Jane Jacobs, Christopher Alexander etc. ● Environment and behaviour: Theories related to individual behavior and behavior change like theory of planned behavior, theory of reasoned action, place making, etc ● Sociology, Psychology, Economics and interdisciplinary subjects: The "hierarchy of needs" suggested by Abraham Maslow (1954), place attachment, social capital, hedonic pricing, right to the city, etc. | |
| UNIT-III | <p>Research Approaches in Architecture</p> <ul style="list-style-type: none"> ● Introduction to Architectural research approaches such as <ul style="list-style-type: none"> ○ Qualitative (Grounded theory, Ethnography, Interpretivism), simulation and modelling, case study, etc. ○ Need and significance of Visual Research methods. ○ Visual Research Methods in Architecture such as <ul style="list-style-type: none"> ▪ Observation ▪ Environmental mapping. ▪ Photo Interviewing. ▪ Videography in behavioural studies. ▪ Tracking for behavioural research. | (10 Hours) |
| UNIT-IV | <p>Advances in Building Technology, Systems and Services</p> <ul style="list-style-type: none"> ● Advance building technology such as 3D printing, technology for high-rise structures, etc. ● Innovations in construction management ● Innovative building materials ● Advances in Building Systems and subsystems such as BIM, automation, etc, relationship and analysis of sub-systems; Building systems for different building typologies, Optimization; Control systems for various buildings services, Types of controllers. ● Advances in Building Services such as services for high rise structures, integrating services. | (10 Hours) |
| UNIT-V | <p>Climate Change and Sustainable Architecture</p> <ul style="list-style-type: none"> ● Climate Change Science, Adaptation and mitigation <p>Climate Change Science, Trends and Impacts of Climate Change, Climate Change Adaptation and Mitigation, Low Carbon Development, Strategic Frameworks and Policy Approaches for Mitigation and Low Carbon Development.</p> | (10 Hours) |

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|---|---|------------------|
| | <ul style="list-style-type: none"> ● International Policies and Legal Framework for Climate Change and Planning for Climate Change <p>International Initiatives to Support Climate Change, The Climate Change Policy Framework, Provisions of the United Nations Framework Convention on Climate Change (UNFCCC), The Kyoto Protocol, Main Issues and Negotiation Streams. Planning of cities and other human settlements aiming towards SDG, Initiatives to reduce resource use and environmental impact of cities.</p> <ul style="list-style-type: none"> ● Sustainable Architecture: <p>Relationship between buildings and greenhouse gas emissions, climate and building, energy and resource conservation in buildings, occupant’s comfort and health, inclusive building design.</p> | |
| UNIT-VI | <p>Architecture Pedagogy and Professional Practice</p> <ul style="list-style-type: none"> ● Learning <ul style="list-style-type: none"> ○ Meaning and definition, Domains of Learning: Cognitive, Affective and Psychomotor, Methods of learning. ● Pedagogy in Architecture <ul style="list-style-type: none"> ○ Introduction to Principles of Teaching and Maxims of Teaching, Approaches of Teaching, Lesson Planning. ● Professional Practice <ul style="list-style-type: none"> ○ The architectural profession and the role of professional bodies and statutory bodies; Code of Conduct and ethics in professional practice and the mandatory provisions of the Architects Act 1972 ○ Copyright and Patenting in Architecture Profession, Arbitration, Easements, Consumer Protection Act | (10Hours) |
| Assignments: | | |
| IA | | |
| | Minimum 4 assignments based on above units | |
| UE will be based on above units with internal options. | | |
| Text Books/References: | | |
| 1. | Henry Sanoff. Visual Research Methods in Design. New York: Van Nostrand Reinhold, 1991 | |
| 2. | Robert Bechtel et al (eds). Methods in Environmental and Behavioral Research, NY:VanNostrand Reinhold, 1987. | |

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|-----|---|
| 3. | Gary T Moore et al. Environmental Design Research Directions: Process and Prospect. New York: Preager Publishers, 1985. |
| 4. | Sanndren L. & Stone S. (2021) <i>Emerging Practices in Architectural Pedagogy: Accommodating an Uncertain Future</i> , London, Routledge |
| 5. | Boyer C.C., (1899), <i>Principles and Methods of teaching</i> , Philadelphia, J.B. Lippincott Company |
| 6. | Sharma T.C.,(2003), <i>Principles of Teaching</i> , Anmol Publications Pvt. Ltd. |
| 7. | Sharma T.C. (2004), <i>Meaning of lifelong learning</i> , New Delhi, Sarup and Sons. |
| 8. | Mangal S.K., (2011), <i>Advanced Educational Psychology</i> , New Delhi, PHI Learning Pvt. Ltd |
| 9. | Jyothi S.K.,Roa D.H.& Jha A.K.(2007), <i>Educational Research</i> , New Delhi, Sonali Publications. |
| 10. | Best J.W & Kahn J.V (2016), <i>Research in Education</i> , Pearson India Education services Pvt. Ltd |
| 11 | Salama A., (1995), <i>New Trends in Architecture Education: Designing the Design Studio</i> Raleigh, N.C.: Tailored Text. |
| 12 | Simons, H. (2009). Case Study Research in Practice. New Delhi, Sage. |
| 13 | Groat, L., & Wang, D. (Eds.). (2002). Architectural Research Methods: John Wiley and Son. |
| 14 | Zeisel, J. (2006). Inquiry by Design (Revised ed.). New York W.W.Nortan & Company |
| 15 | Climate Change and Sustainable Development: Global Perspective by R.K. Mishra, P.S. Janaki Krishna, et al. |
| 16 | Smart Cities for Sustainable Development (Advances in Geographical and Environmental Sciences) by Ram Kumar Mishra, Ch Lakshmi Kumari, et al. |
| 17 | Evaluating Climate Change Action for Sustainable Development / Uitto et al. |
| 18 | Sustainable Communities Design Handbook: Green Engineering, Architecture, and Technology, Second Edition |
| 19 | Planning Urban Futures with Reference to Sustainable Cities by Rosario Adapon Turvey |
| 20 | Transit Oriented Development and Sustainable Cities:Economics, Community and Methods |
| 21 | The SAGE Handbook of Architectural Theory by C. Greig Crysler - University of California, Berkeley, USA, Stephen Cairns - University of Edinburgh, UK,Hilde Heynen - Catholic Univeristy of Leuven, Belgium |
| 22 | A Primer on Theory of Architecture by Karen Spence |
| 23 | Design of Cities by Edmund Beacon |
| 24 | A reader in planning theory by Andreas Faludi |
| 25 | Namavati R.H,(2001), <i>Professional practice</i> , 2001, Lakhani Book Depot |
| 26 | Apte V.S., (2008), <i>Architectural Practice and Procedure</i> , Padmaja Bhide, Pune. |
| 27 | Rapoport, A. (1969), House Form and Culture, Prentice-Hall, Englewood Cliffs, NJ. |
| 28 | Rapoport, A. (1976), The Mutual Interaction of People and Their Built Environment. A Cross-cultural Perspective, Mouton, The Hague. |
| 29 | Jacob, Jane, The Death and Life of Great American Cities New York: Random House February 1993 [1961]. ISBN 0-679-60047-7. |
| 30 | Kostof, Spiro, The City Shaped: Urban Patterns and Meanings Through History, Second edition, Thames & Hudson, New York 1999 |
| 31 | Kostof, Spiro, The City Assembled: Elements of Urban Form through History, second printing Thames & Hudson New York 2005. |
| 32 | Alexander, Christopher, et al. A pattern Language: Towns Buildings, Construction, Oxford 1977 |

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY**

**Discipline: Architecture
Ph.D. Course-work Syllabus**

**Paper-III
Literature Survey and Presentation**

| | | |
|--------------------------------|-----------------------------------|---------------------------------|
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Practicals: 8 Hours/Week | TW/Oral :100 Marks | Total Credits: 04 |

Course Objectives:

- To carry out systematic review literature and present the same

Topics Covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | Searching appropriate literature on broad area of research Identify Research Gap Citation and referencing styles | (32 Hours) |
| UNIT-II | Carry out literature review for selected area of research Compiling and organizing review Writing draft review | (32 Hours) |
| UNIT-III | Writing review-based paper and presentations | (32 Hours) |

Evaluation scheme:

Oral will be based on literature review carried out by the student.

Text Books/References:

- | | |
|----|--|
| 1. | Oliver, P. (2010). <i>Understanding the Research Process</i> . New Delhi: Sage. |
| 2. | Ridley, D. (2012). <i>The Literature Review: A Step-by-Step Guide for Students</i> : SAGE. |
| 3. | APA6 MANUAL |

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <ul style="list-style-type: none"> 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement and enforcement of Copyright and Patents | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <ul style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <ul style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review process <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <ul style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases <p>B. Research Metrics (3.5 hrs.)</p> <ul style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nihs.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019). ISBN: 978-81-939482-1-7
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Board of Studies: Department of Chemical Engineering
PhD: Common Entrance Test (CET) and Course Work-Structure and Syllabus

CONTENTS

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| 1 | Minutes of BoS meeting held on 13.12.2021 |
| 2 | PhD- Common Entrance Test-Syllabus |
| 3 | PhD- Course Work- Structure and Syllabus |

BHARATI VIDYAPEETH
(Deemed to be University)
COLLEGE OF ENGINEERING PUNE – 411043
Chemical Engineering Department

Date: 20 December 2021

Minutes of Meeting of Board of Studies in Chemical Engineering

A meeting of the BoS in Chemical Engineering was conducted on **13 December 2021 at 11:00 am**. Following members were present for the meeting as per notice of meeting dated **02 December 2021** (*Reference No.: BVDU/A15/2807/2021-2022*):

1. Dr. P. V. Chavan (Chairman)
2. Dr. S. M. Jadhav
3. Dr. S. N. Shinde
4. Dr. Y. J. Chendake
5. Mr. P. L. Chaudhari

The minutes of the meeting are as follows:

1. Confirmation of minutes of the previous meeting

Resolution: The minutes of previous meeting held on **22 September 2021 at 11 am** were read and confirmed.

2. Approval of Common Entrance Test (CET) Syllabus for Ph.D. Programme.

Resolution: The Common Entrance Test (CET) Syllabus for Ph.D. Programme has been discussed and subsequently approved. The Common Entrance Test (CET) Syllabus for Ph.D. Programme has been attached as Annexure I.

3. Approval of Structure and Syllabus for Pre-Ph.D. Course Work.

Resolution: The Structure and Syllabus for Pre-Ph.D. Course Work has been discussed and subsequently approved. The Structure and Syllabus for Pre-Ph.D. Course Work has been attached as Annexure II.

4. Any other items with permission of the chair.

Resolution: No other issues were discussed.

Meeting ended with the vote of thanks to the chair and members.

Bharati Vidyapeeth (Deemed to be University)

College of Engineering, Pune

Department of Chemical Engineering

Common Entrance Test (CET) Syllabus for Ph.D. Programme

Bharati Vidyapeeth (Deemed to be University)

Faculty of Engineering and Technology

Ph. D. Entrance Test Syllabus

Specific Subject: Chemical Engineering

Topics covered

Engineering Mathematics

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors; Calculus: Functions of single variable, Limit, continuity and differentiability, Taylor series, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima; Numerical methods for Chemical Engineering: Roots of polynomial equation, curve fitting, interpolation; Numerical differentiation and integration: Differentiation by Euler's, Runge Kutta, Milne' Predictor method, Integration by trapezoidal and Simpson's rule. Single and multi-step methods for numerical solution of differential equations.

Fluid Flow Operations

Fluid Statics; Newtonian and non-Newtonian fluid behavior; Flow of incompressible fluids in pipe: friction factor, Hagen Poisuille equation; Flow of compressible fluids: Processes of compressible flow, adiabatic frictional flow, isothermal frictional flow; Flow past immersed bodies: drag and drag coefficient, Kozeny-Carman equation, motion of particles through fluids, Fluidization: Conditions for fluidization, minimum fluidization velocity, applications of fluidization; Two phase flow: Gas/liquid, liquid/liquid and gas/solid flow, flow types and regimes in horizontal and vertical flow, regime map, behavior of non-Newtonian fluids in two phase flow.

Process Calculation and Chemical Engineering Thermodynamics

Basic Chemical Calculations; Energy balance; Material balance; recycle, bypass and purge calculations.

First and Second laws of thermodynamics: Applications of first law to close and open systems, second law and entropy; Thermodynamic properties of pure substances: Equation of state and residual properties; Properties of mixtures: Partial molar properties, fugacity, excess properties and activity coefficients; Phase equilibria: predicting VLE of systems, thermodynamic consistency of experimental equilibrium data; Chemical reaction equilibrium, Introduction to molecular thermodynamics of fluid phase equilibrium.

Heat Transfer and Mass transfer

Basic modes of heat transfer: Conduction, convection, radiation; Heat exchangers and evaporators: Design of double pipe, shell and tube heat exchangers, and single and multiple effect evaporators; boiling, condensation.

Fick's law of diffusion and mass transfer theories; Heat mass and Momentum analogies; HTU and NTU concept; Process design concepts of mass transfer equipments: distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification, and adsorption.

Chemical Reaction Engineering

Kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, kinetics of solid catalyzed reactions: diffusion with reaction in porous catalyst, mechanism of catalytic reactions, development of rate equations, estimation of kinetic parameters, external/internal mass and heat transfer resistances in catalyst particles; non ideal reactors; residence time distribution; single parameter model; non-isothermal reactors; rate and performance equations for catalyst deactivation.

Process Dynamics and Control

Transfer function and dynamic responses of various systems: first order, second order, interacting, non interacting, transportation lag, inverse response system; Controller modes P, PI, PID; Stability testing methods: Routh stability, Root locus, Bode diagram, Nyquist plot; Controller tuning: Z-N, Cohen Co, process reaction curve method; Control systems with multiple loops: MIMO control systems, interaction and decoupling of control loops; Advance control systems: cascade, ratio, smith predictor, selective control, adaptive and inferential control systems.

Project Engineering and Economics

Techno economic feasibility report; Primary utilities; Secondary utilities; Process design development; Process selection; Principles of process economics; Cash flow for industrial operation; Total product cost: Manufacturing cost, direct production cost, fixed charges, general expenses; Balance sheet; Depreciation; Break even chart; Plant location and layout; Critical path method (CPM); Program evaluation and review technique (PERT); Basic engineering data for plant design.

Text Books/References:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi, 2017.
2. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

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|-----|---|
| 3. | S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, 6 th Edition, Tata-McGraw Hill Publications, 2012. |
| 4. | W. L. McCabe, J. C., Smith, and P. Harriott, Unit Operations of Chemical Engineering, McGraw-Hill, 6th. Ed., 2001 |
| 5. | J.M. Coulson, J. F. Richardson, J. R. Backhurst, J. H. Harker, Chemical Engineering Volume 1, 6th edition, Pergamon Press, 2003. |
| 6. | B. I. Bhatt and S. M. Vora, Stoichiometry (SI Units), 5th Ed., Tata McGraw Hill Publishers, New Delhi, 2010. |
| 7. | J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication |
| 8. | K.V. Narayanan, Chemical Engineering Thermodynamics, PHI Learning Pvt. Ltd. |
| 9. | J. P. Holman, Heat Transfer , 9th edn. The McGraw-Hill Companies, 2008 |
| 10 | D. Q. Kern, Process Heat Transfer, Tata McGraw-Hill Edition, 1997 |
| 11. | J. H. Wetly, C.E. Wicks and R. E. Wilson, Fundamentals of momentum, heat and Mass transfer, John Wiley and sons |
| 12. | A. L. Hines, and R. N. Maddox, Mass Transfer Fundamentals and Applications, Prentice Hall |
| 13. | C.J. King, Separation Processes, Tata McGraw Hill |
| 14. | G. F. Froment and K.B. Bischoff, Chemical Reactor Analysis and Design, John Wiley and Sons |
| 15. | J. M. Smith Chemical Engineering Kinetics, McGraw-Hill |
| 16. | W.H. Press, S A Teukolsky S.A., W. T. Vetterling, and B.P. Flannery, Numerical Recipes in Multi-Language Code, Cambridge University press |
| 17. | Sharma, M. M. and L. K. Doraiswamy, Heterogeneous Reactions, John Wiley and Sons |
| 18. | G. Stephanopoulos, Chemical Process Control :An Introduction to Theory and Practice, Prentice Hall |
| 19. | D.R. Coughanowr, Process Systems Analysis and Control, McGraw Hill |
| 20. | M. S. Peters and K. D. Timmerhaus, Plant Design and economics for chemical engineers, fourth edition, Mc Graw Hill Publications, 2002. |

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Chemical Engineering
Doctoral Programme- 2021

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Department of Chemical Engineering
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|--|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Chemical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | - | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 08 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-I****Research Methodology**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|----------------|---|------------------|
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |
| UNIT-II | Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection | (8 Hours) |

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| | using a digital computer system, case studies of data collection. | |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing</p> <p>Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics</p> <p>Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work</p> <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |
| | | |

| Assignments | |
|-----------------------------------|---|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| Text Books/Reference Books | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, KedarNath Ram Nath& Co.,1972 |
| 5. | B.L.Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Multiphase Reaction Engineering**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total credit : 04 |

Topics Covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | Introduction to Multiphase Reactors Classification; Qualitative description of multiphase reactors; Application of industrial importance; Two case studies | (08 Hours) |
| UNIT-II | Thermodynamics and Kinetics Thermodynamic feasibility; Estimation of equilibrium constant; Determination of equilibrium composition; Determination of rate controlling step and overall rate of reaction. | (08 Hours) |
| UNIT-III | Hydrodynamic Characteristics Hydrodynamic characteristics of prominent multiphase reactors: Pressure drop; Force balance equations; Effect of geometrical, system, and operating parameters on hold-up profile; Velocity- hold-up relationships; Flow visualization techniques; Modelling and simulation | (08 Hours) |
| UNIT-IV | Mixing Characteristics Mixing characteristics of prominent multiphase reactors: Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors; Quantification of phase mixing; Development of a mathematical model. | (08 Hours) |
| UNIT-V | Heat Transfer and Mass Transfer Studies | (08 Hours) |

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| | <p>Heat transfer characteristics of prominent multiphase reactors: Effect of geometrical, system, and operating parameters on heat transfer coefficient; Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors.</p> <p>Mass transfer characteristics of prominent multiphase reactors: Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique; Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors; Quantification of mass transfer coefficient; Application of correlations available to different multiphase reactors.</p> | |
| UNIT-VI | Design of any two multiphase reactors of industrial relevance | (08 Hours) |
| Assignments | | |
| 1. | Enlist model reactors to discern rate controlling step and estimation of overall rate of reaction for a given multiphase system. Elaborate any one with reference to industrial case study. | |
| 2. | Study recent research articles (not less than five) on hydrodynamic aspects of any one multiphase system and prepare a conclusive report. | |
| 3. | Enlist flow visualization techniques. Elaborate any one for a given multiphase system. | |
| 4. | Enumerate recent modelling and simulation approaches for transport processes in any one multiphase system (A report and/or presentation). | |
| 5. | Study recent research articles (not less than five) on mixing aspects of any one multiphase system and prepare a conclusive report. | |
| 6. | Study of any one industrial case: Modification in multiphase system to reduce back-mixing. | |
| 7. | Report on recent advances in heat and mass transfer characteristics of a given multiphase system. | |
| 8. | Prepare a report and make a presentation on “Probable ways to enhance of heat and mass transfer rate” for a given industrial multiphase system. | |
| 9. | Visit chemical process industry and propose modification for any one multiphase system to increase profitability. | |
| 10 | Design multiphase system for a given operation/process on a commercial scale. | |

| Text Books/Reference Books | |
|-----------------------------------|--|
| 1 | L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 nd Edition, Volume I and II. |
| 2 | G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 th Edition, Academic Press, London, 1994 |
| 3 | W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000 |
| 4 | DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 nd Edition, Butterworth Heinemann, 1991. |
| 5 | J. F. Davidson and Harrison, "Fluidization", 10 th Edition, Academic Press, London, 1994 |
| 6 | V. G. Pangarkar, "Design of Multiphase Reactors", 1 st Edition, John Wiley, New Jersey, 2015 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Waste Water Treatment**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

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|-----------------|--|------------------|
| UNIT-I | <p>Introduction: Need of waste water treatment, sources of waste water, major constituents of waste water, impact of waste water on environment and mankind, conventional methods of waste water treatment, limitations of conventional waste water treatment methods.</p> <p>Physical and chemical methods of waste water treatment</p> <p>Physical methods: Screening, mixing, flocculation, gravity separation, grit removal, sedimentation, clarification, adsorption, filtration, floatation etc.</p> <p>Chemical methods: Coagulation, precipitation, phosphorus removal, disinfection and chemical oxidation etc.</p> | (8 Hours) |
| UNIT-II | <p>Biological methods of waste water treatment:</p> <p>Aerobic treatment processes: Activated sludge process, aerated lagoons, aerobic digestion, trickling filters, biological contactors etc.; Anaerobic processes: Anaerobic contact process, anaerobic digestion etc., Anoxic processes, Facultative processes.</p> <p>Advanced oxidation processes (AOPs):</p> <p>Introduction, Fundamentals and background of AOPs for water and wastewater treatment, basic reaction mechanism of AOPs</p> | (8 Hours) |
| UNIT-III | <p>Ozonation and Photo induced AOPs</p> <p>Ozonation: background and fundamentals, reaction kinetics and mechanisms, Application of homogeneous and heterogeneous catalytic ozonation in water</p> | (8 Hours) |

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| | treatment; Fundamentals of UV irradiation: Absorption and bond dissociation energy, UV sources and their characteristics, Choice of photo source–used in AOPs; Photo induced AOPs: Mechanism of photo induced AOPs Oxidation using ultraviolet irradiation and hydrogen peroxide (UV/H ₂ O ₂), oxidation using ultraviolet irradiation and ozone (UV/Ozone), oxidation using combination of ultraviolet irradiation, hydrogen peroxide and ozone (UV/H ₂ O ₂ /Ozone). | |
| UNIT-IV | Heterogeneous Photo-Catalysis Fundamentals of semiconductor photo-catalysis: Various semiconductor particles used in photocatalytic applications, visible light driven photo-catalysts, photocatalytic reactions and kinetic studies and introduction to nanophoto-catalysis; Photocatalytic reactors: Solar energy driven or artificial light photo reactors, solar collectors, design of slurry or supported catalyst reactors, comparing reactor efficiencies and reuse of catalyst. | (8 Hours) |
| UNIT-V | Homogeneous and Heterogeneous Fenton processes Fenton process, photo-Fenton process, Advanced Fenton process, mechanism of Fenton based processes, merits and demerits of homogeneous and heterogeneous Fenton processes. | (8 Hours) |
| UNIT-VI | Emerging AOPs and its industrial applications Electrochemical oxidation, Ultrasound processes, principles of sonochemistry and acoustic cavitation, ultrasound cavitation and its combination with other AOPs, synergistic and antagonistic effects; hydrodynamic cavitation and its combination with other AOPs such as hydrogen peroxide, Ozone, Fenton, photo-Fenton etc. | (8 Hours) |
| Assignments | | |
| 1 | Preparation of technical report based on industrial applications of waste water treatment | |
| 2 | Preparation of power point presentation based on recent trends in photocatalysis | |
| 3 | Preparation of technical report based on ultraviolet irradiation and hydrogen peroxide for the degradation of dyes | |
| 4 | Study any three recent research papers related to advanced oxidation processes and prepare/present | |

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| | power point presentation. |
| 5 | Group discussions on any of the following topics: a) Merits and demerits of various AOPs b) Ozonation and Photo induced AOPs |
| 6 | Determine the ultrasonic power density of given ultrasonic processor |
| 7 | Prepare a technical report on recent trends in waste water treatment by ultrasound cavitation |
| 8 | Determine the hydraulic characteristics of any cavitating device |
| 9 | Prepare a technical report on recent trends in waste water treatment by hydrodynamic cavitation |
| 10 | Industrial case study –Application of AOPs in textile/ petroleum/ pharmaceutical industry |

Text Books/Reference Books

| | |
|----|--|
| 1. | Simon Parsons, Advanced oxidation processes for water and wastewater treatment, IWA Publishing, 2004. |
| 2. | Thomas Oppenlander, Photochemical Purification of Water and Air: Advanced Oxidation Processes (AOPs): Principles, Reaction Mechanisms, Reactor Concepts, Wiley-VCH Publishing, 2003. |
| 3. | Vincenzo Belgiorno, Vincenzo Naddeo and Luigi Rizzo, Water, wastewater and soil treatment by Advanced Oxidation Processes (AOP), Lulu Enterprises, 2011. |
| 4. | Jean-Pierre Franc, Jean-Marie Michel, “Fundamentals of Cavitation”, Kluwer Academic Publishers, Dordrecht. |
| 5. | T. J. Mason and J. P. Lorimer, “Applied sonochemistry: Uses of power ultrasound in chemistry and processing”, Wiley-VCH publishers. |
| 6. | Metcalf and Eddy, “Waste water Engineering Treatment and Reuse”, McGraw Hill Publishers |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Separation and Purification**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total Credit : 04 |

Topics Covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | Distillation Fundamentals of distillation, Multicomponent distillation, Rigorous method, Lewis-Matheson method, Thiele-Geddes method, Amundson-Pontinen method, Azeotropic and extractive distillation: Activity coefficient, equilibrium relationship, binary and ternary azeotropes, selection of solvent, calculations. | (08 Hours) |
| UNIT-II | Extraction Selection of extractant, distribution coefficient, extraction equipment stagewise operation, countercurrent operation, concurrent operation, multicomponent extraction, regeneration, regeneration efficiency, extractant selectivity | (08 Hours) |
| UNIT-III | Adsorption Preparation of Adsorbent Materials, Biosorbents, Determination of factors affecting adsorption, Properties of Adsorbent Materials, Structural parameters and models, Adsorption Analysis, Kinetics of adsorption and Adsorption rate equations, Isotherms – Langmuir, Freundlich and B.E.T., Mechanism of adsorption of cations, anions, organics and surfactants, Batch and Column dynamics, multisorbate sorption, Applications of Direct and | (08 Hours) |

| | | |
|----------------|---|-------------------|
| | indirect measurement of adsorption of gases and vapours on adsorbent using various techniques, Bio-sorption, Industrial applications. | |
| UNIT-IV | Reactive Separations Types of Reactive separations: Reactive -distillation, extraction, adsorption, chromatography, crystallization, absorption; Fundamentals of Reactive separations: Thermodynamics and catalysis aspect; Kinetic experiments and Modeling; Batch and continuous study; Design of hardware; Modeling aspects of continuous systems; Industrial applications of Reactive separations | (08 Hours) |
| UNIT-V | Membrane separation Selection of membranes and processes, ultrafiltration, microfiltration, nanofiltration, reverse osmosis, gas separation, pervaporation, dialysis, electrodialysis, membrane formation, module formation, design of separation process, fouling and fouling reduction | (08 Hours) |
| UNIT-VI | Other separation techniques Zone melting, Separation based on thermal diffusion, Separation based on surface science, Adductive crystallization, affinity chromatography and immuno chromatography, Ionic separation | (08 Hours) |

Assignments

| | |
|----|---|
| 1. | Define and analyze distillation system and efficiency for industrial applications – Case study |
| 2. | Study of mass transfer equations for Multicomponent distillation. |
| 3. | Adsorption system design with regeneration and adsorbent life analysis. |
| 4. | Preparation of biosorbents with improved properties. |
| 5. | Thermodynamic study of the system involved in the separation |
| 6. | Kinetic experiments for the selected separation system |
| 7. | Prepare case study report on extraction and industrial application |
| 8. | Reactive extractant, properties of extractants and issues related the same during real life application – literature survey |
| 9. | Selection of membrane process and design of system based upon application and process conditions |

| | |
|-----------------------------------|--|
| 10. | Issues during membrane process applications: fouling, concentration polarization and solutions regarding the same |
| 11. | Zone melting conditions and applicability – case study |
| 12. | Literature report Immuno chromatography and its biomedical applications |
| 13 | Literature review on recent developments on chromatographic separations. |
| 14 | Report on ionic separations, efficiency, importance and related issues |
| Text Books/Reference Books | |
| 1 | Barry C, Thomas W.J., “Adsorption Technology and Design” 1 st Edition, Elsevier 1998. |
| 2 | Douglas M. Ruthven, “Principles of Adsorption and Adsorption Processes”, 1 st Edition, Wiley-Interscience, 1984 |
| 3 | Bohumil Volesky, “Sorption and Biosorption”, 1 st Edition, St. Lambert, Quebec, 2003 |
| 4 | C. A. Alzate, M. O. Sanchez and P. Y. Andrianovich, Reactive Separation for Process Intensification and Sustainability, CRC Press, 2019, ISBN 9780367281519. |
| 5 | S. Kulprathipanja, Reactive Separation Processes, Taylor and Francis CRC press, Kindle edition, 2002. |
| 6 | Smith B. D., “Design of Equilibrium Stage Processes”, McGraw Hill Book Company Ltd., 2003 |
| 7 | King C. J., “Separation Processes”, McGraw Hill Book Company Ltd., 1980 |
| 8 | Marcel Moulder, “Basic Principles of Membrane Technology”, Prentice Hall, 1996 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Modelling and Simulation**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|-------------------------------------|-------------------------|
| Lectures : 04 Hours/Week | End Semester Examination : 60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment : 40 Marks | Practical/Oral : - |
| Total : 04 Hours/Week | Total : 100 Marks | Total credit : 04 |

Topics Covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | Modelling Fundamentals Classification of models; Model building and conservation principles; Steady state and dynamic models; Lumped and distributed parameter models; Solution strategies for lumped and distributed parameter models; Model calibration and validation. | (08 Hours) |
| UNIT-II | Phenomenological Modelling of Chemical Systems and Solutions Modeling of separation systems: Extraction, distillation, adsorption, membrane separation, reactive separations, waste water treatment and multiphase systems. | (08 Hours) |
| UNIT-III | Artificial Intelligence (AI)-based Modelling Introduction to Artificial Intelligence (AI); Applications of AI to Chemical Engineering; Introduction to various AI- based formalisms; Principal component analysis; Cause and effect relationships; Black box modelling; AI- based modelling formalisms: Artificial Neural Networks (ANNs); Genetic Programming (GP); Support Vector Regression; Fuzzy Logic (FL); Applications of these formalisms to Chemical engineering. | (08 Hours) |
| UNIT-IV | Artificial Neural Networks (ANNs) Biological background; ANN classification; Computational properties of | (08 Hours) |

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| | ANNs; Modelling a single neuron; Building blocks of feed-forward neural network: Bias, Processing elements, Input layer, hidden layer, Output layer, Learning rate, Momentum, Transfer function; Error back propagation. | |
| UNIT-V | Genetic Programming (GP) Introduction to evolutionary algorithms; Dependent variables; Independent variables; Mathematical operators; Initial population; Candidate solution; Tree structure; Initialization; Fitness evaluation and selection; Crossover; Mutation. | (08 Hours) |
| UNIT-VI | Simulation of Chemical Processes Simulation approaches: modular approaches, equation-solving approach; decomposition of networks: tearing algorithms, algorithms based on the signal flow graph, algorithms based on reduced digraph; Simulation of Engineering Systems: Monte-Carlo simulation, simulation of continuous and discrete processes, numerical methods to simulate engineering problems | (08 Hours) |
| Assignments | | |
| 1. | Write a mathematical model for unit operation and processes involved in selected chemical system | |
| 2. | Prepare a report on modelling and simulation of different chemicals systems | |
| 3. | Collect experimental data from literature and estimate unknown parameters for chemical reactors/heat exchanger/distillation unit. | |
| 4. | Modeling of distillation/extraction/adsorption/ absorption/ crystallisation for a problem from the literature | |
| 5. | Students have to study any five NPTEL videos related to Artificial Intelligence and prepare/present power point presentation. | |
| 6. | Group discussions on any of the following topics: a) Role of Artificial Intelligence in Chemical Engineering b) Phenomenological, empirical and AI-based modelling c) Artificial Intelligence and Chemical Industries | |
| 7. | Collect and read recent research papers on Artificial Neural Network and chemical process modelling and prepare summery report. | |
| 8. | Collect and read recent research papers on Genetic Programming and chemical process modelling | |

| | |
|-----|---|
| | and prepare summery report. |
| 9. | Analyse the results for case study with Principal Component Analysis and interpret the results. |
| 10. | Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments. |
| 11. | Solving numerical based on heat transfer using modelling and simulation concept. |
| 12. | Simulate the given problem by using computational tools like MATLAB/ ASPEN/ ChemCAD/ g-Proms |

Text Books/Reference Books

| | |
|---|--|
| 1 | K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001. |
| 2 | W. L. Luyben, "Process Modeling, Simulation and Control for Chemical Engineers", 2 nd Edn., McGraw Hill Book Co., New York, 1990. |
| 3 | B. P. Zeigler Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2 nd Edition. Academic press 2000 |
| 4 | A. K. Jana, Chemical Process Modelling and Computer Simulation, Prentice Hall India, 2 nd Edition, 2011 |
| 5 | J. Koza, Genetic Programming: On the Programming of Computers by Means of Natural Selection, MIT Press, Cambridge, MA, 1992. |
| 7 | C. M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press, Oxford, 1995. |
| 8 | S. S. Tambe, B. D. Kulkarni, and P. B. Deshpande, Elements of Artificial Neural Networks with Selected Applications in Chemical Engineering, and Chemical & Biological Sciences, Simulation & Advanced Controls Inc., Louisville, K.Y.,1996. |

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BVDDU/IMED/68712021-22

Date: 29th October 2021

To,

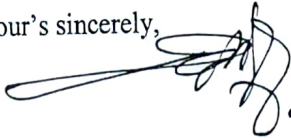
Shri G.Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune

Subject: Syllabus for PhD Course on Research and Publication Ethics


Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.


Your's sincerely,



Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.



Sr. Shashank Joshi
Dean Faculty of Engineering



Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

Ph. D. Entrance Test Syllabus

Specific Subject: Civil Engineering

Topics covered

| | |
|-----------------|---|
| UNIT-I | Hydraulics Engineering : Hydraulics: Types of fluid flows, Laminar and Turbulent fluid flow, Continuity, Momentum and Energy equations and their applications; Flow measurement in channels, Flow in pipes, Pipe networks. Hydrology: Hydrologic cycle, Rainfall, Evaporation, Infiltration, Unit Hydrographs; Irrigation, Duty, Delta, Crop water requirements; Gravity and Earth dams. |
| UNIT-II | Structural Engineering: Concrete: Concrete making materials and its properties; Mix design. Structural Mechanics: Analysis of flexure, Torsion, Shear, Compression and Tension; Shear force and Bending moment diagram, combined and direct bending stresses. Concrete Structures: Working stress and Limit state design concepts. Steel Structures: Plastic analysis and Limit state design concepts. |
| UNIT-III | Environmental Engineering: Water and Waste Water: Water standards, Surface water treatment, Distribution of water; Sewage and Sewerage treatment; Primary, secondary and tertiary treatment of waste water, characteristics of wastewater; Effluent discharge standards. Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits. Municipal Solid Waste Management: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal). |
| UNIT-IV | Geotechnical Engineering : Geotechnical: Index properties of soil, soil structure, Permeability, Seepage analysis, Compaction and Consolidation and shear strength. Foundation: Site explorations & investigations, Methods of soil exploration, Terzaghi's bearing capacity analysis, Pile foundations, Pile group and its efficiency. |
| UNIT-V | Surveying, Remote Sensing and Geographical Information System Surveying: Principles of surveying. Remote Sensing: Definition of RS, Benefits of RS over conventional method of surveying, Components of RS system. Geographical Information System: Fundamentals and components of GIS, Application of RS and GIS in Civil engineering. |

| | |
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| | |
| Text/References Books: | |
| 1. | Fluid Mechanics, Frank M. White, McGraw Hill publications |
| 2. | Open Channel Flow, Hanif Chowdhary, Springer publications |
| 3. | Mechanics of Solids, S. Crandall, N. Dahl and T. Lardner, McGraw-Hill publications |
| 4. | Structural Analysis, Hibbeler R. C., Prentice Hall publications |
| 5. | Wastewater Treatment and Reuse, Metcalf and Eddy, McGraw Hill publications |
| 6. | Foundation Analysis and Design, Bowles JE(1996), McGraw Hill publications |
| 7. | Advanced Soil Mechanics, Das. B. M(1997), Taylor and Francis publications |
| 8. | Basics of Remote Sensing and GIS, Dr. S Kumar, Laxmi publications |

Bharati Vidyapeeth (Deemed to be University)
Faculty of Engineering and Technology
Revised Structure of Pre. Ph. D. coursework (2021)
Civil Engineering

| Sr. No. | Subject | Teaching Scheme | | Examination Scheme (marks) | | | | Credits |
|---------|---|-----------------|----------|----------------------------|---------------------|---------------|------------|-----------|
| | | L | P/D | Theory examination | Internal assessment | Presentations | Total | |
| 1 | Paper- I: Research Methodology | 4 | - | 60 | 40 | - | 100 | 04 |
| 2 | Paper –II : Research Area Specific | 4 | - | 60 | 40 | - | 100 | 04 |
| 3 | Literature survey and presentation | | 4 | - | 50 | 50 | 100 | 04 |
| 4 | Paper –IV: Research Publications and Ethics | 2 | 2 | 30 | 20 | | 50 | 02 |
| | Total | 10 | 6 | 150 | 150 | 50 | 350 | 14 |

List of Research Area Specific Subjects Paper -II

- 1 Hydraulic Engineering
- 2 Environmental Engineering
- 3 Structural Engineering
- 4 Traffic and Transportation Engineering

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-I****Research Methodology**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology(ICT) in research,maintaining literature data using software tools,tabulation and graphical presentation of research data,use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |
| UNIT-II | Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection,selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection. | (8 Hours) |
| UNIT-III | Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | (8 Hours) |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. | (8 Hours) |

| | | |
|----------------|---|------------------|
| | <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |

Assignments:

| | |
|-----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| | |

Text Books/References:

| | |
|----|--|
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma, Operational Research, KedarNath Ram Nath & Co., 1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Pre-Ph.D. Course-work Syllabus****Paper-II Research Area Specific Subject : 1 Hydraulic Engineering**

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | FLUID MECHANICS Types of fluid flow, continuity equation, circulation and vorticity, stream function and velocity potential function. Dynamics of fluid flow, Euler's equation of motion, Bernoulli's equations and its applications. Dimensional analysis. | (08 Hours) |
| UNIT-II | ADVANCED FLUID MECHANICS Viscous flow ,laminar and turbulent flows and, Navier Stokes equation of motion, Boundary layer theory and , momentum equation for boundary layer, separation of boundary layer, Analysis of flow using CFD technique. | (08 Hours) |
| UNIT-III | OPEN CHANNEL FLOW Gradually varied flow, governing equations, computation of GVF in prismatic and non prismatic channels, rapidly varied flow and application of Momentum equation, Transient flow analysis. | (08 Hours) |
| UNIT-IV | HYDROLOGY Unit Hydro graph, S-curve and IUH, Clark's method of IUH. Synthetic Unit-hydrograph. Floods: Frequency analysis, normal, log-normal and Gumbel's distributions, envelope curves, empirical formulae and regional flood frequency analysis. | (08 Hours) |
| UNIT-V | WATER RESOURCES ENGINEERING Hydraulic structures such as Gravity dams, Earthen dams, Rock fill dams, Barrages ,Bridges, Spillways, Energy dissipators, | (08 Hours) |
| UNIT-VI | SEDIMENT TRANSPORT Sediment problems, significant sediment properties, beginning of sediment movement – Shields analysis, critical tractive stress of non uniform sediments. Bed Forms and Resistance: Description of bed forms, flow regimes, their significance, resistance analysis, different resistance laws. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units**Text Books/References:**

1. Shames, "Mechanics of Fluids", McGraw Hill,2000
2. V.T.Chow, "Applied Hydrology", Tata McGraw Hill Publication,2005

| | |
|----|---|
| 3. | Garde R. J., Ranga Raju K. G., “Mechanics of Sediment Transportation and Alluvial Stream Problems” , New Age International (P) Limited, New Delhi, 2004 |
| 4. | V. T. Chow, “Open Channel Flow”,McGraw Hill Publication, 1990 |
| | |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper-II Research Area Specific Subject : 2 Environmental Engineering

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| | | |
|-----------------|---|-------------------|
| UNIT-I | <p>WATER TREATMENT</p> <p>Aeration: Types of aerators, gravity aerator and fixed spray aerator.</p> <p>Sedimentation: Plain Sedimentation, Principles and types of plain Sedimentation, Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator; Tube settlers: Introduction</p> <p>Filtration: Theory of filtration, types of filters, design criteria, working and washing of rapid sand filter, design of rapid sand filter.</p> <p>Disinfection of water</p> <p>Advance Treatment Methods: Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.</p> | (08 Hours) |
| UNIT-II | <p>SEWAGE TREATMENT</p> <p>Characteristics of sewage – Physical, Chemical, Biological. Introduction to unit operations and processes.</p> <p>Primary, Secondary and tertiary treatment</p> <p>Disposal: Methods and effluent standards for disposal of sewage Sludge treatment</p> | (08 Hours) |
| UNIT-III | <p>INDUSTRIAL WASTE WATER TREATMENT: Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater. Sources, characteristics, treatment & disposal of effluent for the following industries: Sugar, dairy and Pulp & Paper. Effluent Discharge standards as per CPCB norms. Introduction to concept of CETP (Common Effluent Treatment Plant.)</p> | (08 Hours) |
| UNIT-IV | <p>AIR POLLUTION:</p> <p>Classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards, Meteorology and Gaussian dispersion model.</p> <p>Air Pollution Control: Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric</p> | (08 Hours) |

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| | filters, and electrostatic precipitators. | |
| UNIT-V | SOLID AND HAZARDOUS WASTE MANAGEMENT: Waste Generation, Composition, Source reduction of wastes, Handling and segregation of wastes at source, storage and collection, Transport, Waste processing, Composting, Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation, Integrated Solid waste management: Principles and Elements of Integrated Solid waste management | (08 Hours) |
| UNIT-VI | ENVIRONMENTAL MANAGEMENT: Introduction, Principle, Fundamentals Environmental Management Systems- Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling, Environmental Management Tools: Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits Environmental Legislation: Rules and Regulations of Environmental laws in India (Water and Air), | (08 Hours) |
| Internal Assessment will consist of assignments based on above six units | | |
| Text Books/References: | | |
| 1. | Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981. | |
| 2. | Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995. | |
| 3. | Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985. | |
| 4. | George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993 | |
| 5 | CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000. | |
| 6 | Dr. M. N. Rao and Dr. Razia Sultana, ‘ Solid and Hazardous Waste management’ BSP Books Pvt. Ltd. 2012 | |
| 7 | I. V. Murali Krishna and ValliManickam, ‘Environmental Management’, BSP, Books Pvt. Ltd. 2014 | |
| 8 | S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977. | |
| 9 | Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997. | |
| 11 | Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006. | |
| 12 | C.L. ell, Solid Waste Management, John Wiley, 1975 | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

FACULTY OF ENGINEERING AND TECHNOLOGY

Pre-Ph.D. Course-work Syllabus

Paper-II Research Area Specific Subject :3 Structural Engineering

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| UNIT-I | SOLID MECHANICS Determination of axial stress, bending stress and shear stress developed in member at particular location in the cross section. Calculation of principal stresses and location of principal planes. | (08 Hours) |
|-----------------|---|-------------------|
| UNIT-II | ANALYSIS OF STRUTURES Analysis of determinate and indeterminate beams, frames and trusses in plane. Determinations of support reactions, Calculation of member forces - axial force, shear Force and bending Moment at particular section in the member. Deflected shape of the structure. | (08 Hours) |
| UNIT-III | CONCRETE TECHNOLOGY AND COMPOSITES Materials for Concrete, Properties and Testing of Materials, Properties of Concrete, I.S. Code Requirements, Methods of Mix design Modern and Special Concreting Techniques, Advanced Concrete Materials, Concrete Composites, Nan concrete. | (08 Hours) |
| UNIT-IV | DESIGN OF STEEL STRUCTURES Load calculation, Design load, Concept of limit state design. Design of members for axial tension and compression force, Flexure and shear using structural steel. Design of bolted and welded connections. | (08 Hours) |
| UNIT-V | DESIGN OF R.C.C.STRUCTURES Concept of R.C.C., Stress block Parameters, Concept of under reinforced, balanced over reinforced section, Analysis and design of rectangular, flanged and doubly reinforced beams. Design of slabs, beams, columns and footings. Analysis of special structures –Retaining wall, combined footing, Water Tanks, Frames. | (08 Hours) |
| UNIT-VI | EARTHQUAKE RESISTANT STRUCTURES Determination of EQ loads – Static , Dynamic Method Concept of Single degree , Multiple degree Freedom System , Concept of Shear Wall, Design of a shear wall Ductile Detailing, Use of I.S. 13920 for ductile detailing. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units

Text Books/References:

1. Timoshenko and Goodier-Theory of Elasticity, McGraw-Hill publications.

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| 2. | S.Crandall, N.Dahl and T.Lardner-Mechanics of Solids McGrew-Hill publications |
| 3. | Anil K Chopra-Dynamics of Structures -Theory and Applications to Earthquake Engineering, Prentice-Hall publications. |
| 4. | R.W.Clough and J.Penzin- Dynamics of Structures McGrew-Hill publications |
| 5 | R.C.Roy –Structural Dynamics an Introduction to Computer Methods, John Wiley &sons publications |
| 6 | S. Timoshenko and W.Krieger, Theory of plates and Shells, McGrew-Hill. |
| 7 | Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication |
| 8 | V. L. Shah and Dr. S. R. Karve , “Limit State Theory and Design”, Pune VidyarthiGriha Publications |
| 9 | S.K.Duggal. “ Earthquake Resistant Design” – Oxford Publications |
| 11 | Hibbeler R.C., “Mechanics of Materials”, Pearson Prentice Hall, |
| 12 | Beer F..P. and Johnston E.R., “Mechanics of Materials”, McGraw Hill Publication |
| 13 | Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication |
| 14 | N. Subhramanian, “ Design of Steel Structures”, Oxford University Press |
| 15 | N. Subhramanian, “ Design of R.C.C. Structures”, Oxford University Press |
| 16 | IS:800-2007, General Construction in Steel - Code of Practice |
| 17 | IS:808-1989, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections |
| 18 | IS:456-2000, “ Code of Practice for Plain and reinforced Concrete Structures” |
| 19 | IS: 1893- 19 ,” Code of Practice for Earhquake design |
| 20 | IS: 13920-Code of Practice for Dctile detailing of Earthquake Resistant Structures |

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper-II - Research Area Specific Subject : 4 Traffic and Transportation Engineering

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| Lectures: 4 Hours/Week | Theory Examination: 60 Marks Internal Assessment : 40 Marks | Total credits: 04 |
| | Duration : 3Hrs | |

Topics covered

| | | |
|-----------------|--|-------------------|
| UNIT-I | Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics - IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads - PCU concept and its limitations - Road user facilities - Parking facilities - Cycle tracks and cycleways - Pedestrian facilities. Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies. | (08 Hours) |
| UNIT-II | Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelisation - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination. | (08 Hours) |
| UNIT-III | Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Road. | (08 Hours) |
| UNIT-IV | Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures | (08 Hours) |
| UNIT-V | Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. | (08 Hours) |
| UNIT-VI | Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system. | (08 Hours) |

Internal Assessment will consist of assignments based on above six units.

Text Books/References:

1. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons

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| 2. | Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc. |
| 3. | Khanna and Justo, Highway Engineering |
| 4. | Kadiyali L.R. Traffic and Transportation Planning |
| | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
FACULTY OF ENGINEERING AND TECHNOLOGY

Ph.D. Course-work Syllabus

Literature Survey and Presentation

| Teaching Scheme | Examination Scheme | Credits Allotted |
|--------------------------|--------------------------------|-------------------------|
| Lectures : - | End Semester Examination :-- | Theory : -- |
| Practical : 4 Hours/Week | Internal Assessment :50 Marks | TW/ Oral :04 |
| | External Assessment : 50 Marks | Total Credits : 04 |
| | | |

Evaluation

Internal Assessment (50 marks)

Candidates have to submit a synopsis that should include Introduction, literature review, objectives of the research, research methodology and conclusions.

External Assessment (50 marks)

Candidates have to give the presentation of the research topic.

Objectives of the course

Candidates should search for appropriate literature on broad area of research, identify research gap, carryout literature review of selected area of research, decide the objectives of the research and workout the methodology for research.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Pre-Ph.D. Course-work Syllabus

Paper 04 - Research Publications and Ethics

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|-------------------------|--|--------------------------|
| | Theory Examination: 30 Marks Internal assessment : 20 Marks | Total credits: 02 |
| | | |

Course Title: Course for awareness about the publication ethics and publication misconduct.

Overview: This course has total six units focusing on basics of philosophy of science and ethics, research integrity, publication. Hands on sessions are designed to identify research misconduct, and predatory publications. Indexing and citation databases, open access publications, research metrics (Citations , h-index, Impact Factor etc.) and plagiarism tools will be introduced in this course.

Pedagogy: Class room teaching, guest lectures, group discussion and practical sessions.

Evaluation: Total Marks 50: (20 IE +30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

Syllabus in detail (Theory)

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|-----------------|--|-------------------|
| UNIT-I | <p>Philosophy and Ethics:</p> <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | (04 Hours) |
| UNIT-II | <p>Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (04 Hours) |
| UNIT-III | <p>Publication Ethics:</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents | (07 Hours) |

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| | Practical | |
| UNIT-IV | Open Access Publishing: 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | (04 Hours) |
| UNIT-V | Publication Misconduct: A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review proces B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other | (04 Hours) |
| UNIT-VI | Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (07 Hours) |

References:

1. Bird,A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics.London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a> 6o
8. Indian National Science Academy (INSA), Ethics in Science Education, Research and 978-81-939482-1-7. Governance (2019). ISBN: https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamo Responsible conduct of Research: Oxford University Press
10. Comstock: Research ethics:Cambridge university Press
11. Robin: Research ethics: Indiana University press
12. Tony Mayer: Promoting Research Integrity in a Global Environment: World Scientific Publishing
13. Paul Oiver: The Student's Guide to ResearchEthics:Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance: Indian National Science Academy
15. David V Thiel : Research methods for Engineers: Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Femanda Menéndez. (2013). Practices of Ethics: An Empirical

Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.

17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.

18. Clive Opie (2004). Doing Educational Research A Guide for First time researchers. New Delhi: Vistar Publications.

19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.

20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethies of Science. Switzerland.Springer International Publishing

Bharati Vidyapeeth
(Deemed to be University), Pune
Faculty of Engineering and Technology

Board of Studies in Computer and IT Engineering

Minutes of Meeting

The meeting of Board of Studies of BV(DU) Pune was held on 11th December 2021 at 12:00 pm in the Computer Engineering Department, BV(DU)COE Pune -43.

Following members were present for the meeting...

1. Chairman Prof. Dr. S. H. Patil
2. Prof. Dr. S. B. Vanjale
3. Prof. Dr. Prakash Devale
4. Dr. Bindu Garg
5. Dr. J Naveenkumar
6. Dr. Amol Kadam

Dr. Pramod Jadhav was absent with prior permission for meeting.

The following points were discussed in the meeting.

Item No 1

Confirmation of the minutes of the previous meeting.

Resolution

The minutes of the previous meeting were read and discussed with the members.

Item No. 2

To restructuring Ph.D. CET syllabus and course work.

Resolution

The members were asked to share their views on the course names and research trends in the various courses related to computer engineering and information technology. Based on the research trends and advancement in the foundational courses like Database management systems, Data mining, Computer architectures, system software, software engineering four courses were proposed for course work of Ph.D. in Computer and IT engineering by the members. The four courses were finalised and accepted unanimously. The courses are Advanced Software Engineering, Data Science and Intelligent Computing, Advanced System architecture and Software and Modern Networking. The detailed Syllabus of the courses is attached as annexure with this minute.

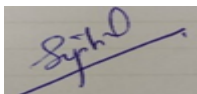
Item No. 3

Any other item with permission of the chair

Resolution

Revision and Appointment of Internal and External Examiners are made for the different courses. The same information is shared with University Exam Section.

The Meeting concluded with thanks to the chair.



Prof. Suhas Patil

Chairman Board of Studies

Computer Engineering & IT

Bharati Vidyapeeth (Deemed to be University), Pune-30.

Bharati Vidyapeeth
(Deemed to be University), Pune

Syllabus for Ph. D. Entrance Exam

Computer Engineering

Section – II

| Unit No. | Syllabus |
|----------|--|
| 1 | Mathematical Foundation and Data Structures and Algorithms: Sets, Propositions, Relations, Functions, Graphs, Introduction to Probability theory, Theory of Computation: Formal Languages, Types of Grammars and Languages, Chomsky classification of Languages, Recursive and recursively enumerable sets, Operations, Theory of Automata: Finite State Models, Minimization, Regular sets and Regular Grammars, Pumping Lemma, Closure properties, Applications of Finite automata, Context Free Grammar and Push Down Automata, equivalence of PDA and CFG, Deterministic PDA, Normal forms, Applications of CFG, Turing machines and Linear Bounded Automata. Abstract Data Types: Arrays, Polynomial, Sparse Matrices, Strings, Stacks & Queues, Multiple Stacks & Queues and its applications, Linked Lists: Singly Linked Lists, Reusable Linked List Class, Circular Lists, Linked Stacks & Queues, Polynomials, Equivalence Classes, Sparse Matrices, Doubly Linked Lists, Generalized Lists. Complexity Analysis. Trees: types, Graphs: Operations, complexity analysis, sorting: types, operations and its complexity analysis, Symbol Tables: Static Hashing - Dynamic Hashing, Heap Structures, Advanced data structures: Optimal binary search tree |
| 2 | Computer Organisation and Architecture: Boolean algebra and Minimization of Boolean functions, Flip-flops-types, Race condition and comparison. Design of combinational and sequential circuits. Representation of Integers: Octal, Hex, Decimal, and Binary. 2's complement and 1's complement arithmetic. Floating point representation. Combinational Circuit Design, Sequential Circuit Design. Hardwired and Micro- programmed processor design, Instruction formats, addressing modes, memory types and organizations, Interfacing peripheral devices, Interrupts. Microprocessor architecture, Instruction set and Programming (8086, P-III/P-IV). Microprocessor applications. Assembly language fundamentals (8085 based assembly language programming). Assemblers -2-pass and single-pass. Macros and |

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| | <p>macro-processors. Loading, linking, relocation, linkage editing. Text editors. Programming environments. Debuggers and program generators. Compilation and Interpretation. Bootstrap compilers. Phases of compilation process. Lexical analysis. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom-up parsers –Shift-reduce, operator precedence, and LR. YACC package on Unix system. Top-down parsers-left recursion and its removal. Recursive descent parser. Predictive parser. Intermediate codes-Quadruples, Triples, Intermediate code generation, Code generation, Code optimization.</p> |
| 3 | <p>Computer Programming and Analysis & Design of Algorithms: Programming language concepts, paradigms, and models. Programming in C: Elements of C-Tokens, identifiers, data types, operators in C. Control structures in C. Sequence, Selection, and iterations (s). Structured data types in C-arrays, struct, union, String, and pointers. I/O statements, User defined and built-in functions, Parameter passing. Object Oriented Programming Concepts: Class, Object, Instantiation, Inheritance, polymorphism and overloading, dynamic biding, reference semantics and their implementation. Algorithm specification and Characteristics, Divide and Conquer: General method, Binary search, Maximum and Minimum, Merge sort, Quick sort, Selection sort, Strassen’s Matrix multiplication, Greedy: General method, Knapsack problem, Job sequencing with deadlines, MST, Optimal storage on tapes, Optimal merge pattern, Single source shortest path. Dynamic Programming: General method, Multistage graph, All Pair Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack., Backtracking: General method, 8-Queens problem, Sum of Subsets, Graph Colouring, NP-hard and NP- complete problems, time and space complexity.</p> |
| 4 | <p>Operating System and Computer Networks : Types of Operating Systems, Features and Functions of the Operating System, Process Management, Process Synchronization and Deadlocks, Memory Management, File System, Disk Management, Unix system, Filters and Commands, System Calls, Agreement Protocols for handling Processor Failures, Distributed Mutual Exclusion, Distributed Operating Systems, Local and Global states, Failure Handling and Recovery Mechanisms, Multiprocessor Operating Systems and related Thread Handlings, Token and Non-token based Algorithms, Network fundamentals : Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks. Topologies, Networking Devices. The OSI model, TCP/IP model. Protocols for –(i) Data link layer, (ii) Network layer, and (iii) Transport layer, TCP/IP protocols, Networks security, Network administration. Application layer</p> |

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| | protocols, Flow and error control techniques, Introduction to intelligent networking, Performance analysis of networks. |
| 5 | Database Management System and Software Engineering: Relational Database Design, E-R and E-E-R Model, Architecture, Relational model, Relational Algebra, Relational Calculus, Relational design, Normalization, 1NF, 2NF, 3NF, BCNF and 4NF. Indexing and Hashing, Storage and File Structures, Transaction Management, Concurrency Control. SQL: Joins, SQL/PL-SQL. Data mining and its algorithms, OLAP, OLTP. Advanced Database systems: Parallel Databases, Distributed Databases, NoSQL Databases, Spatial Database, Multimedia Databases, Mobile Databases and Web-enabled Database Systems. Software life cycle models: Prescriptive Models, Specialised process Models, Agile Development Process, Requirement Engineering, feasibility analysis, Domain specific modelling, Software Design, Systems Modelling Language, Software architecture and design patterns, user interface design, Software Coding, Testing, Testing strategies, Software reliability and Advanced testing techniques, Software Quality management, Software Metrics, Software Configuration, Software maintenance and reengineering, Software project management - Planning and managing the project, Aspect oriented programming. |

Books:

| | |
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| 1. | Mathematical Foundation: Kenneth Rosen |
| 2. | Data Structures and Algorithms Aho Ullman |
| 3. | Computer Organisation and Architecture: John P. Hayes |
| 4. | System Software: Dhamdhare Dhananjay |
| 5. | Computer Programming: Rajaraman |
| 6. | Analysis & Design of Algorithms: Hurwitz Sahani |
| 7. | Operating System: William Stalling |
| 8 | Computer Networks: Tannenbaum |
| 9 | Database Management System: Korth |
| 10 | Software Engineering: Pressman |

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Bharati Vidyapeeth
(Deemed to be University)
Pune, Maharashtra, India

Faculty of Engineering and Technology

Ph.D. (Computer Engineering)

Course Work Scheme and Syllabus

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|--|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Computer Engineering* | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | 02 | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 10 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

***Programme Specific Courses (Anyone to be opted)**

- Advanced Software Engineering
- Data Science and Intelligent Computing
- Advanced System Architecture and Software
- Modern Networking

Paper-I

Research Methodology

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | <p>Introduction</p> <p>Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.</p> <p>Role of information and communication technology(ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature</p> <p>Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review</p> <p>Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation</p> <p>Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection</p> <p>Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing</p> | (8 Hours) |

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| | Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc. | |
| UNIT-IV | Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM) | (8 Hours) |
| UNIT-V | Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication. | (8 Hours) |
| UNIT-VI | Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor. Research Ethics: ethical issues in research, plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights. | (8 Hours) |

Assignments

| | |
|----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |

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| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |

Textbooks/References:

| | |
|----|--|
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma, Operational Research, Kedarnath Ram Nath& Co.,1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

| Advanced Software Engineering | | | |
|--|-------------------------------|--------------------------|--|
| | | | |
| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Requirement Engineering and Estimation | | | |
| <p>Requirements engineering: Requirements Elicitation, Requirement Elicitation techniques, Requirement Analysis, Requirement Analysis Models, Requirement Documentation, Requirement Management.</p> <p>Size Estimation: Function Point Analysis from DFD's, ER diagram, Function Point Analysis from Use Case Diagram & Class Diagram, Mask II FPA, LOC estimation, Conversion between size measures, Effort, schedule & cost estimation: Estimation factors, COCOMO-II, Estimation by Analogy, Validating Software Estimates.</p> | | | |
| Unit II: Software Design | | | |
| <p>Software Design Fundamentals: General Design Concepts, Context of Software Design, Software Design Process, Software Design Principles</p> <p>Key Issues in Software Design: Concurrency, Control and Handling of Events, Data Persistence, Distribution of Components, Error and Exception Handling and Fault Tolerance, Interaction and Presentation, Security Software Structure and Architecture: Architectural Structures and Viewpoints, Design Patterns, Architecture Design Decisions, Families of Programs and Frameworks</p> <p>User Interface Design: General User Interface Design Principles, User Interface Design Issues, The Design of User Interaction Modalities, The Design of Information Presentation, User Interface Design Process, Localisation and Internationalisation, Metaphors and Conceptual Models</p> <p>Software Design Quality Analysis and Evaluation, Software Design Notations, Software Design Strategies and Methods, Software Design Tools</p> | | | |
| Unit III: Software Construction & Testing | | | |
| <p><u>Software Construction Fundamentals</u>, Minimizing Complexity, Anticipating Change, Constructing for Verification, Reuse, Standards in Construction, Construction in Life Cycle Models, Construction Planning, Construction Measurement,</p> <p>Practical Considerations: Construction Design, Construction Languages, Coding, Construction Testing, Construction for Reuse, Integration, Construction Technologies, Software Construction Tools, Development Environments, GUI Builders, Unit Testing Tools, Profiling, Performance Analysis, and Slicing Tools.</p> <p><u>Software Testing Fundamentals</u>: Key Issues, Relationship of Testing to Other Activities, Test Levels, The Target of the Test, Objectives of Testing, Test Techniques, Based on the Software Engineer's Intuition and Experience, Input Domain-Based Techniques, Code-Based Techniques, Fault-Based Techniques, Usage-Based Techniques, Model-Based Testing Techniques, Techniques Based on the Nature of the Application, Selecting and Combining Techniques, Test-Related Measures: Evaluation of the Program Under Test, Evaluation of the Tests Performed, Test Process, Practical Considerations, Test Activities</p> | | | |

Software Testing Tools: Testing Tool Support, Categories of Tools.

Unit IV: Software Configuration Management and Maintenance

Management of the SCM Process, Organizational Context for SCM, SCM Plan, Software Configuration Identification, Identifying Items to Be Controlled, Software Library, Software Configuration Control, Requesting, Evaluating, and Approving Software Changes, Implementing Software Changes, Software Configuration Status Information, Software Configuration Status Reporting, Software Configuration Auditing, Software Release Management and Delivery, Software Configuration Management tools.

Software Maintenance Fundamentals, Nature of Maintenance, Need for Maintenance, Majority of Maintenance Costs, Evolution of Software, Categories of Maintenance

Key Issues in Software Maintenance: Technical Issues, Management Issues, Maintenance Cost Estimation, Software Maintenance Measurement,

Maintenance Process, Maintenance Activities, Program Comprehension, Reengineering, Reverse Engineering, Migration, Retirement, Software Maintenance tools.

Unit V: Software Engineering Process, Models and Methods

Software Process Definition, Software Process Management, Software Process Infrastructure

Software Life Cycles: Categories of Software Processes, Software Life Cycle Models, Software Process Adaptation, Practical Considerations.

Software Process Assessment and Improvement: Software Process Assessment Models, Software Process Assessment Methods, Software Process Improvement Models, Continuous and Staged Software Process Ratings.

Software Measurement: Software Process and Product Measurement, Quality of Measurement Results, Software Information Models, Software Process Measurement Techniques, Software Engineering Process Tools.

Modelling: Modelling Principles, Properties and Expression of Models, Syntax, Semantics, and Pragmatics, Preconditions, Postconditions, and Invariants.

Types of Models: Information Modelling, Behavioural Modelling, Structure Modelling.

Analysis of Models: Analysing for Completeness, Analysing for Consistency, Analysing for Correctness, Traceability, Interaction Analysis

Software Engineering Methods: Heuristic Methods, Formal Methods, Prototyping Methods, Agile Methods.

Unit VI: Software Quality

Software Quality Fundamentals: Software Engineering Culture and Ethics, Value and Costs of Quality, Models and Quality Characteristics, Software Quality Improvement, Software Safety.

Software Quality Management Processes: Software Quality Assurance, Verification & Validation, Reviews and Audits.

Practical Considerations: Software Quality Requirements, Defect Characterization, Software Quality Management Techniques, Software Quality Measurement, Software Quality Tools.

References

- [1] P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014; www.swebok.org.
- [2] Maxim, B. R., Pressman, R. S. (2014). Software Engineering: A Practitioner's Approach. United Kingdom: McGraw-Hill Education.
- [3] Sommerville, I. (2011). Software Engineering, 9/e. India: Dorling Kindersley.

| Data Science and Intelligent Computing | | | |
|--|-------------------------------|--------------------------|--|
| | | | |
| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Big Data and Data Science | | | |
| Current landscape of perspectives, Statistical Inference - Populations and samples - Statistical modelling, probability distributions, fitting a model, Exploratory Data Analysis and the Data Science Process - Basic tools., Feature Generation and Feature Selection algorithms, Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis, Mining Social-Network Graphs, Data Visualization. | | | |
| Unit II: Statistical Computing | | | |
| Probability Theory: Sample Spaces- Events - Axioms – Counting - Conditional Probability and Bayes’ Theorem – The Binomial Theorem – Random variable and distributions, Curve Fitting and Principles of Least Squares- Regression and correlation, The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Sampling distributions (Chi-Square, t, F, z). Test of Hypothesis, Tabular data- Power and the computation of sample size, Linear models- Logistic regression- Rates and Poisson regression, Nonlinear curve fitting. Density Estimation- Recursive Partitioning, Multidimensional Scaling Cluster Analysis. | | | |
| Unit III: Artificial Intelligence | | | |
| State Space Search, Heuristic Search, Randomised Search, Finding Optimal Paths, Problem Decomposition, Planning, Game Playing, Constraint Satisfaction Problems, Knowledge based Reasoning, Logic and Inferences, Structured knowledge representations, Natural Language Processing, Reasoning under uncertainty. | | | |
| Unit IV: Machine Learning Techniques | | | |
| Naïve Bayesian classifiers, Inferences in Bayesian Networks, hidden Markov Models, Concept Learning, Decision Trees, K-Means clustering algorithm, Learning from outcomes, Artificial Neural Networks, Reinforcement Learning. | | | |
| Unit V: Deep Learning | | | |
| Feed forward Neural networks - Gradient descent - Back propagation algorithm - Activation Functions - ReLU Heuristics for avoiding bad local minima - Regularization. CNN building blocks – common architecture – Training Pattern - LSTM - GRU - Encoder Decoder architectures – LeNet – miniVGGNet – learning rate scheduler - Spotting under fitting and over fitting – Architecture visualization. Auto encoders (standard, sparse, de noising, contractive), Applications of Deep Belief Nets, RNN, Generative Adversarial Networks | | | |
| Unit VI: Application Trends | | | |

Character/ handwriting Recognition - Image Compression, visualizing an image, Image Augmentation, image captioning, Language Modelling- Satellite image processing, Recommendations systems, Classification using Convolutional Neural Networks - Dialogue Generation with LSTMs, NLP and Vector Space Model of Semantics,

References

- [1] Noreen Burlingame and Lars Nielsen, "A Simple Introduction to Data Science", 2012.
- [2] Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data", The McGraw-Hill Companies, 2012.
- [3] Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
- [4] Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, LLC, 2014.
- [5] Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4 th edition, Academic Press; 2009.
- [6] Machine learning by Tom M. Mitchell, McGraw Hill 1997
- [7] Neural Networks: A systematic Introduction, Raul Rojas, 1996
- [8] Pattern Recognition and Machine Learning, Christopher Bishop, 2007
- [9] Dr. Adrian Rosebrook "Deep learning for computer vision with python". Starter Bundle, IST Edition.2017.
- [10] Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016

| Advanced System Architecture and Software | | | |
|---|-------------------------------|--------------------------|--|
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| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: | | | |
| Data-Level Parallelism in vector, SIMD, and GPU Architectures: Introduction, Vector Architecture, SIMD Instructions Set Extensions for Multimedia, Graphics Processing Units, Detecting and Enhancing Loop-level Parallelism, Crosscutting Issues, Mobile versus Server GPUs and Tesla versus Core i7, Fallacies and Pitfalls, Case Study | | | |
| Unit II: | | | |
| Thread-Level Parallelism: Introduction, Centralized Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors, Distributed Shared-Memory and Directory-Based Coherence, Models of Memory Consistency Multicore Processors and Their Performance, Vector Processors Why Vector Processors? Basic Vector Architecture, Two Real-World Issues: Vector Length and Stride, Enhancing Vector Performance, Effectiveness of Compiler Vectorization | | | |
| Unit III: | | | |
| Hardware and Software for VLIW and EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically, Detecting and Enhancing Loop-Level Parallelism, Scheduling and Structuring Code for Parallelism, Hardware Support for Exposing Parallelism: Predicated Instructions, Hardware Support for Compiler Speculation, The Intel IA-64 Architecture and Itanium Processor | | | |
| Unit IV: | | | |
| Introduction to Operating System and Process Management: Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Pre-emptive, non-pre-emptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls. | | | |
| Unit V: | | | |
| Concurrency control Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill | | | |
| Unit VI: | | | |
| Memory Management Memory Management requirements, Multi-Processor Based and Virtualization Concepts Virtual machines; hypervisor. Basics of Network Operating System, Server Operating System, and Real Time Operating System | | | |

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| References |
| [1] Hennessey and Patterson: “Computer Architecture a Quantitative Approach”, 5th Edition, Elsevier, 2013. [2] Kai Hwang: Advanced Computer Architecture - Parallelism, Scalability, Programmability, 2nd Edition, Tata McGraw Hill, [3] Operating System Concepts, 9th [4] Abraham Silber Schatz, John Wiley & Sons, Inc. [5] Modern Operating Systems -By Andrew S. Tanenbaum (PHI) [6] Operating Systems 5th Edition, William Stallings, Pearson Education India. |

| Modern Networking | | | |
|---|-------------------------------|--------------------------|--|
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| Teaching Scheme | Examination Scheme | Credits Allotted | |
| Lecture: 04 Hours/Week | Theory Examination: 100 Marks | Total Credit: 04 Credits | |
| | | | |
| Unit I: Modern Networking | | | |
| Networking Ecosystem, Network Architectures, Global Network Architectures, Typical network Hierarchy, Ethernet: Application, Standards and data rates, Wi-Fi, 4G and 5G Cellular, Cloud Networking, Internet of things – Evolution, Layers of IoT, Network Convergence, Types of networks and Internet Traffic, Elastic and Inelastic traffic, real time traffic characteristics, QoS and QoE requirements, Routing, Congestion Control. | | | |
| Unit II: Software Defined Networks | | | |
| Evolving network requirements, SDN Approach – Requirements and architecture, Characteristics, SDN related standards, SDN Data Plane: Data Plane functions, protocols. OpenFlow logical network Device – Flow table structure, flow table pipeline, OpenFlow protocol. SDN Control Plane: Functions, Interfaces, Routing, ITU-T Model, Open Daylight, REST, Cooperation and coordination among Controllers, SDN Application Plane: Architecture, Abstraction layers, Traffic, Security | | | |
| Unit III: Network Virtualisation | | | |
| Network Functions Virtualisation Concepts, Virtual machines, NFV Benefits and requirements, NFV Reference architectures, NFV Functionality – Infrastructure, Virtualised network functions, NFV management and Orchestration, NFV use cases, Virtual LANs, Virtual private Networks, Software Defined Infrastructure. | | | |
| Unit IV: Cloud Computing and Internet of Things | | | |
| Cloud Platform Architecture over Virtualized Data Centers, Cloud Computing and Service Models, Services and Service- Oriented Architecture, Message-Oriented Middle-ware, Portals and Science Gateways, Discovery, Registries, Metadata and Databases, Work-flow in Service-Oriented Architectures, Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. IoT Architecture – M2M high-level ETSI architecture, IETF architecture for IoT – OGC architecture, IoT reference models, IoT protocol – M2M and WSN protocols – SCADA, RFID, IEEE 802.15.4 – BACNet protocol – Zigbee, Modbus, 6LowPAN, CoAP, security. | | | |
| Unit V: Wireless Networks | | | |
| 3G and 4G networks, UMTS, UTRAN, Cellular Networks, LTE, Control Plane and User Plane, WiMAX, Wireless Sensor Network, Adhoc and Heterogenous networks, VLC and Li-Fi networks, VLC Modulation schemes. | | | |
| | | | |

Unit VI: Security

Mathematical Foundation - Probability and Information Theory - Algebraic Foundations – Number Theory. Confidentiality Modes of Operation – Key Channel Establishment For Symmetric Cryptosystems, Encryption – Symmetric Techniques, Asymmetric Techniques And Data Techniques, Authentication, Information System Threats and attacks, Classification of Threats and Assessing Damages 18 Security in Mobile and Wireless Computing,

References

- [1] Stallings, W. (2015). Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud. United Kingdom: Pearson Education.
- [2] Distributed and Cloud Computing- Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra – Elsevier-2012
- [3] Cloud Computing – A Hands-on Approach – Arshdeep Bahga, Vijay Madiseti – University Press2014
- [4] Enterprise Cloud Computing – Gautam Shroff – Cambridge University Press – 2014.
- [5] Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
- [6] Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
- [7] Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
- [8] Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.
- [9] Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
- [10] Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
- [11] C.Siva Ram Murthy and B.S.Manoj, Adhoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education.
- [12] Pei Zheng and Lionel M Li, „Smart Phone & Next Generation Mobile Computing“, Morgan Kaufmann Publishers, 2006.
- [13] Charles E. Perkins, Ad hoc Networking, Addison – Wesley
- [14] Wireless Sensor networks: Feng Zhao, Leonidas Guibas –Morgan Kaufmann Publications – 2012.
- [15] Fundamentals of Wireless sensor networks Theory and Practice – Walteneus Dargie, Christian Poellabauer – Wiley – 2010
- [16] Principles of LED Light Communications: Towards Networked Li-Fi, Svilen Dimitrov, Harald Haas

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BV00/IMED/6871201-22

Date: 29th October 2021

To,


Shri G. Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune


Subject: Syllabus for PhD Course on Research and Publication Ethics

Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.

Your's sincerely,


Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.


Sr. Shashank Joshi
Dean Faculty of Engineering


Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework

Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|--|---------|
| 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement and enforcement of Copyright and Patents | |
| Practical RPE 04: Open Access Publishing: 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | 4 hours |
| RPE 05: Publication Misconduct: A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review process B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools. | 4 hours |
| RPE 06: Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | 7 hours |

References:

- Bird, A. (2006) Philosophy of Science. Routledge.
- MacIntyre, Alasdair (1967) A Short History of Ethics. London.
- P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
- National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
- Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
- Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
- <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamoo : Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing. UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland .Springer International Publishing.

**Bharati Vidyapeeth
Deemed to be University,
College of Engineering Pune**

Ref. no. BVDUCOE/Elect./133/2021-22

Date : 15/12/2021

Subject: Minutes of Meeting of Board of Studies in Electrical Engineering

A meeting of the members of Board of studies in Electrical Engineering was held (online) on 13/12/2021 at Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune at 11.00 AM.

The following members of the board were present

- | | | |
|-----------------------|---|----------|
| 1. Dr. D.S. Bankar | : | Chairman |
| 2. Dr. R.M. Holmukhe | : | Member |
| 3. Mr. S. A. Namekar | : | Member |
| 4. Mrs. R. S. Ambekar | : | Member |
| 5. Mr. V.V. Mhetre | : | Member |

Mr. Y. B. Mandake were remained absent with prior permission.

The following points were discussed in the meeting,

1. Confirmation of minutes of previous meeting.

Resolution : The minutes of previous BoS meeting conducted on 13/09/2021 were read and confirmed.

2. Approval of CET syllabus of Ph.D. Entrance examination.

Resolution : The aspects of curriculum revision was discussed along with its salient features. Accordingly, the proposed syllabus of Ph.D. Entrance examination (CET) was discussed in detail along with the suggestions received from the experts and approved the same.

The proposed syllabus of Ph.D. Entrance examination (CET) is attached in annexure I.

3. Approval of structure and syllabus of Pre Ph.D. Coursework

Resolution : The aspects of revision of structure and syllabus of Pre Ph.D. Coursework was discussed along with its salient features. Accordingly, the proposed structure and syllabus of Pre Ph.D. Coursework was discussed in detail along with the suggestions received from the experts and approved the same.

The proposed syllabus of Ph.D. Entrance examination (CET) is attached in annexure I.

4. Change of UG programme nomenclature from B.Tech Electrical Engineering to B.Tech Electrical and Computer Engineering.

Resolution : On the basis of prevailing market demand and students perceptions; it is felt that the present nomenclature of B.Tech (Electrical Engineering) should be changed to B.Tech (B.Tech Electrical and Computer Engineering).

Being today's need with reference to job opportunities available, curriculum of Electrical Engineering should have notable Software and Information Technology related contents. It is felt that this will attract the students for admission. This nomenclature will give a sense of development of students for software industries without loosing the core contents of Electrical Engineering. Hence graduate of B.Tech Electrical and Computer Engineering will have core knowledge of Electrical Engineering and Software Engineering too.

B.Tech Electrical and Computer Engineering. programme will focuses on core Electrical Engineering courses in power systems, control systems, electrical machines, power electronics, drives and protection and courses such as modeling, simulation, data analysis for designing and developing software and hardware for industrial needs from computer engineering field. This will create an Electrical Engineering with knowledge of software development related to Electrical Engineering.

The proposed nomenclature is listed in the AICTE handbook, necessary communication will be initiated with AICTE from the institute in due course of time.

Therefore, the proposed nomenclature of B.Tech Electrical and Computer Engineering. have been approved after detailed discussion.

The meeting was concluded with the vote of thanks proposed by the chair.

Prof. Dr. D. S. Bankar
Chairman Board of Studies
Electrical Engineering
Bharati Vidyapeeth (Deemed to be) University, Pune.

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering & Technology

BoS : Electrical Engineering

PhD Common Entrance Test Syllabus

1. Electrical machines and Drives

Single-phase transformer: equivalent circuit, phasor diagram, regulation and efficiency; Three-phase transformers: parallel operation; DC machines: types, characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, equivalent circuit, starting and speed control; single-phase induction motors; Synchronous machines: types, performance and characteristics, regulation and parallel operation of synchronous generator, starting of synchronous motors.

DC motor characteristics, Chopper fed DC drive, Multi-quadrant DC drive, Closed-loop control of DC Drive, Induction motor characteristics, Scalar control or constant V/f control of induction motor, Control of slip ring induction motor

2. Power electronics

Simple diode circuits, Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications. Combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters, Boolean algebra, Sequential Logic, and Its Applications: Storage elements: latches & flip flops, Shift Registers, Ripple Counters, Synchronous Counters. Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

3. Network Theory, Control systems and Microcontrollers

Network Theorems: KCL, KVL, Node and Mesh analysis, star-delta transformation; Superposition, Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations: Initial conditions – Classical method and Laplace transforms methods of solutions. Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method, resonance, two port networks, balanced three phase circuits, complex power and power factor in ac circuits

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems. Introduction to 8051 Microcontrollers Architecture, Features, Pin layout, addressing modes, accessing memory using various addressing modes. Introduction

to PIC Microcontroller, CPU registers, Pin diagram, Instruction pipelining, CPU registers, Addressing modes. Application of PIC Microcontrollers.

4. Measurement, Instrumentation and power system protection

Errors in Measurement & Measurement standards, Measurement of Resistance, Inductance and Capacitance, AC bridges for inductance and capacitance measurement. Electronic Measurements: Electronic instruments: Voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Storage oscilloscope, Spectrum & Wave analyzer, Digital counter, frequency meter, and Digital Voltmeter. *Instrumentation*: Transducers & sensors, classification & selection of sensors, Measurement physical quantities,

Requirement of a circuit breakers, difference between an isolator and circuit breaker, principle of operation of a circuit breaker, Various terms, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers, SF6 breakers, vacuum circuit breakers, lightning arrestor. Non-directional and directional over current relays, IDMT and Directional characteristics, Differential relay, Buchholz relay, Merz price protection. Transformer protection scheme and Transmission line protection, protection of generators and transmission lines.

5. Power system analysis and power quality

Power generation by renewable & non-renewable energy sources. transmission, and distribution. Element of AC distribution, types, Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance. Models of short, medium and long transmission lines, skin, proximity, and Ferranti effect. Classification of cables, insulation resistance, grading of cables. Per unit system, Reactance Diagram, Formation of Y-bus and Z-bus, Load flow problem, power flow equations, load flow solution using Gauss Seidal and Newton Raphson methods, Symmetrical fault, unbalanced faults (Single line to ground fault, Line to line and double line to ground), Concepts of types of stability limits, steady state stability analysis, transient stability analysis, Swing equation and its solution by point-by-point method, Equal area criterion, critical clearing angle and improvement of transient stability.

Power quality terms, Power Quality evaluation procedure, Importance of Power Quality, Symptoms of poor power quality, Power quality terms- its sources, effects and mitigation techniques, Power quality measuring devices, its selection, International standards related to power quality, power quality monitoring.

Annexure - 2
Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering & Technology

BoS : Electrical Engineering

Pre-PhD Course Work- Structure and Syllabi

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Electrical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 08 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

| BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY) | | |
|---|--|-------------------------|
| FACULTY OF ENGINEERING AND TECHNOLOGY | | |
| Ph.D. Course-work Syllabus | | |
| Paper-I | | |
| Research Methodology | | |
| Teaching Scheme | Examination Scheme | Credits Allotted |
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |
| Topics Covered | | |
| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> | (8 Hours) |

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| | <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |
| Assignments: | | |
| 1. | Identify and write the research gap areas based on the literature review. | |
| 2. | Use Mendeley or similar software and list the references in a report. | |
| 3. | Define a research problem and mention the scope and objectives of your research topic. | |
| 4. | Determine the limitations and assumptions of the identified research problem. | |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 6. | Develop a research report based on your research area. | |
| 7. | Prepare effective power point presentation based on your research report. | |
| 8. | Present your research topic to the research committee. | |
| 9. | Design a review paper based on literature review carried out by you. | |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma, Operational Research, Kedar Nath Ram Nath & Co., 1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

Paper-II

Programme Specific Course: Electrical Engineering

Elective – 1 (Application of Power Electronics in Power System)

| Application of Power Electronics in Power System | | |
|---|---|---------------------------------|
| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Pre-requisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, power system, electrical machines, power electronics | |
| Course Objectives: | | |
| 1. | To analyse strong foundation for further study of power electronic circuits and systems | |
| 2. | To examine the HVDC converters and their control system. | |
| 3. | Assess the performance parameters of various types of inverters, analyse and compare different PWM techniques for their control | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Design and examine power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application domains. | |
| 2. | Discuss the principle of operation and model and simulate the advanced converters such as of multi-level converters, PWM rectifiers & Matrix converter | |
| 3. | Formulate and analyse a system-level power electronic design, then evaluate its performance. | |
| 4. | Develop the capacity to design an electrical power system with adequate safety devices while increasing the efficiency of the transmission and distribution system using environmentally friendly technology. | |
| 5. | Assess the various methods of control and compensation to determine the best option for minimising social and environmental problems and recognise the need to keep up with technological developments and integrate them into the current system to improve efficiency, flexibility, and quality of operation. | |
| UNIT I | Power Electronics devices, circuits and applications | (08 Hours) |
| | Survey of power semiconductor devices: Power diode, SCR, BJT, MOSFET, IGBT, Switching characteristics, driver circuits, protection, cooling, application. | |

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| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations | |
| UNIT II | Converters | (08 Hours) |
| | <p>AC-DC converter: Single phase Semi & Full converters for R, R-L loads, PWM</p> <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modelling of DC-DC converters, Power Factor Correction Circuit Design of Switching-Mode Power Supply (SMPS)</p> <p>DC-AC inverter: Single-phase, three-phase, Multilevel inverters, Matrix inverter</p> <p>Harmonics Elimination/Modulation Techniques</p> | |
| UNIT III | Advanced Processors for Power Converters | (08 Hours) |
| | <p>Arm processor architecture and pipelining –programmer’s model – data paths and instruction decoding –ARM instruction set – addressing modes – General Purpose Input and Output (GPIO) - Analog to Digital Converter – Digital to Analog Converter – Simple programming</p> <p>Timers and PWM: Different modes of operation of Timers - Match Registers – Generation of PWM using Compare registers - Capture Control – Single and Double Edge Controlled PWM – programming</p> | |
| UNIT IV | Power System Operations and Quality standards | (08 hours) |
| | <p>Power system operation, Monitoring and Scenario Analysis, Power System Optimization, Power system stability</p> <p>Power quality: issues and mitigation techniques, power quality monitoring standards: IEEE 1159 and IEC 61000 series standards, distributed generation and power quality</p> | |
| UNIT V | Solid State Power Controllers-I | (08 Hours) |
| | <p>FACTS CONCEPTS: Electrical Transmission Network – Necessity – Power Flow in AC System – Power Flow and Dynamic stability considerations of a transmission interconnection – relative importance of controllable parameter – opportunities for FACTS – possible benefits for FACTS Technology – FACTS Controllers – Types, brief description and definitions</p> <p>STATIC VAR COMPENSATION: Need for compensation – introduction to shunt and series compensation – objectives of shunt and series compensation – configuration and operating characteristics</p> | |
| UNIT VI | Solid State Power Controllers-II | (08 Hours) |

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| | <p>SERIES COMPENSATORS: Commutation in DC motors, difference between mechanical and electronic Commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square – Wave permanent magnet brushless motor drives, torque and EMF equation, torque – speed characteristics of Permanent Magnet Brush less DC Motors – controllers PM DC Motor</p> <p>STATIC VOLTAGE AND PHASE ANGLE REGULATORS: Objectives of voltage and phase angle regulators – approaches to Thyristor – Controlled Voltage and Phase Angle Regulator</p> | |
| Continuous Assessment | | |
| <p>The assessment work shall consist of following:</p> <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. N. Mohan et.al. "Power Electronics- Converters, Applications and Design", John Wiley & Sons (Asia) Private Ltd., Singapore, 1996. | | |
| 2. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 3. Andrew N.Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide Designing and Optimizing System Software” Morgan Kaufmann Publishers, 2011 | | |
| 4. Narain G. Hingorani and Laszlo Gyugyi, “Understanding FACTS – Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers, New Delhi, 2001. | | |
| 5. R. Mohan Mathur and Rajiv K. Varma, “Thyristor Based FACTS Controller for Electrical Transmission Systems”, Wiley Interscience Publications, 2002 | | |
| 6. G.T. Heydt, Power Quality, Stars in a Circle Publications, Indiana, 1991. | | |
| 7. T.J.E. Miller, Static Reactive Power Compensation, John Wiley & Sons, New York, 1982. | | |
| 8.Cyril W Lander, Power Electronics, McGraw-Hill International Editions, 1993 | | |

Elective – 2 (Power System and Power Quality)

| Power System and Power Quality | | |
|---|---|---------------------------------|
| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Power systems, Electrical Machines, Power Electronics | |
| Course Objectives: | | |
| 1. | To analyse aspects of power electronic circuits and systems. | |
| 2. | To understand the importance of flexible AC transmission systems and controllers. | |
| 3. | To introduce basic concepts of load and drive interaction, speed control concepts of ac and dc drives, speed reversal, regenerative braking aspects, design methodology. | |
| 4. | To analyse the steady state and dynamic state operation of dc machine and induction machine through mathematical modelling. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Design and evaluate converter circuits and learn to select suitable power electronic devices by assessing the requirements of application domains. | |
| 2. | Apply the concept of reactive power control to AC power system | |
| 3. | Demonstrate the mathematical modelling of electrical machines. | |
| 4. | Analyse and design protection schemes to provide protection for the HVDC transmission against over currents and over voltages | |
| 5. | Analyze the important Power Quality Terms and its related standards | |
| 6. | Analyze various methods of power quality monitoring and management and study the measuring equipment's. | |
| UNIT I | Power Electronics devices and its applications | (08 Hours) |
| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations AC-DC converter: Single phase Semi & Full converters for R, R-L loads, PWM | |

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| | <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modelling of DC-DC converters, Power Factor Correction Circuit Design of Switch Mode Power Supply (SMPS)</p> <p>DC-AC Converter: Single-phase, three-phase, Multilevel inverters, Modulation Techniques</p> | |
| UNIT II | Power System Compensation techniques | (08 Hours) |
| | <p>Transmission Lines, SVC and Loads: Transmission Lines, D-Q Transformation using alpha and beta Variables, Static VAR compensators. UPFC, STATCOM</p> <p>Power system operation, Monitoring and Scenario Analysis, Power System Optimization, FACTS, HVDC, Compensator, Power system stability, Role and design of Capacitor banks, design of FACT devices.</p> | |
| UNIT III | Electrical Machine Modeling and Analysis | (08 Hours) |
| | <p>Modeling of machines: Induction motor theory, Machine modeling, Park's Transformation, Synchronous rotating frame, Reference frame and modeling.</p> <p>Dynamic Modeling of Three Phase Induction Machine: Generalized model in arbitrary frame, electromagnetic torque, derivation of commonly used induction motor models-stator reference frames model, rotor reference frames model, synchronously rotating reference frames model, equations in flux linkages, per unit model, dynamic simulation.</p> | |
| UNIT IV | High Voltage DC Transmission | (08 hours) |
| | <p>INTRODUCTION: Introduction to AC and DC Transmission – application of DC Transmission – description of DC transmission – DC system components and their functions – modern trends in DC Transmission. HVDC Topology.</p> <p>PROTECTION: Basics of protection – DC reactors – voltage and current oscillations – circuit breakers – over voltage protection – switching surges – lightning surges – lightning arresters for DC systems.</p> | |
| UNIT V | Power Quality Issues | (08 Hours) |
| | <p>INTRODUCTION: Power Quality phenomena – Basic terminologies – various events in Power Quality – Causes for reduction in Power Quality — Power Quality Standards</p> <p>VOLTAGE SAG: Causes of voltage sags – magnitude and duration of voltage sags – effect on adjustable AC Drives, DC drives, computers and consumer electronics – monitoring and mitigation of voltage sags. Low voltage ride through capability.</p> | |

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| UNIT VI | Power quality mitigation and Measurement Techniques | (08 Hours) |
| | <p>HARMONICS: Fundamentals of harmonics, applied harmonics, power quality monitoring standards: IEEE 1159 and IEC 61000 series standards, Power Quality Evaluation procedure. Origin of harmonics – effect of harmonics on adjustable speed ac drives – harmonic reduction using PWM and harmonic injection. Harmonic filter selection criteria, distributed generation and power quality. Procedure for Harmonic filter design.</p> <p>MEASUREMENTS: Interpretation and analysis of Power Quality. Power Quality measuring devices, Selection process for measuring devices, Importance of Test Location and Test duration. Power Quality safety considerations.</p> | |
| <u>Continuous Assessment</u> | | |
| The assessment work shall consist of following: | | |
| <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. N. Mohan et.al. "Power Electronics- Converters, Applications and Design", John Wiley & Sons (Asia) Private Ltd., Singapore, 1996. | | |
| 2. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 3. Math. H. J. Bollen, "Understanding Power Quality Problems – Voltage Sags and Interruptions", IEEE Press, 2000 | | |
| 4. David D. Shipp and William S. Vilcheck, "Power Quality and Line Considerations for Variable Speed AC Drives", IEEE Transactions on Industry Applications, Vol. 32, March / April – 1996 | | |
| 5. Hideaki Fujita and Hirofumi Akagi, "The Unified Power Quality Conditioner: The Integration of Series and Shunt Active Filters", IEEE Transactions on Power Electronics, Vol. 13, No. 2, March 1998 | | |
| 6. Christopher J. Melhorn and Mark. F. McGranaghan, "Interpretation and Analysis of Power Quality Measurements", Electrotek Concepts, Inc. 1998 | | |
| 7. Harmonic Distortion in the electric supply system", – Technical Note No. 3 from Integral Energy Power Quality Centre, University of Wollongong, March 2000 | | |
| 8. Electrical Power Systems Quality- R C Dugan, Tata McGraw Hill publications | | |

Elective – 3 (Advances in Renewable Energy Systems)

| Advances in Renewable Energy Systems | | |
|---|--|-------------------------|
| <u>EXAMINATION SCHEME:</u> | | <u>CREDITS</u> |
| | | <u>ALLOTTED:</u> |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, Laplace Transform, Test signals, differential equation solution | |
| Course Objectives: | | |
| 1. | Understand the need of energy conversion and the various methods of energy storage | |
| 2. | To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems. | |
| 3. | Illustrate the concepts of direct energy conversion systems & their applications. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | To analyse strong foundation for further study of power electronic circuits and systems | |
| 2. | To examine the energy efficient technologies for electrical systems. | |
| 3. | Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation | |
| 4. | Explore the concepts involved in wind energy conversion system by studying its components, types and performance. | |
| 5. | Demonstrate the generation of electricity from various non-Conventional sources of energy, have a working knowledge on types of fuel cells | |
| 6. | Examine the applications of optimization techniques for renewable energy systems. | |
| UNIT I | Power Electronics for Renewable Energy Systems | (08 Hours) |
| | Thyristor, Gate and Base Drive Circuits: Preliminary Design Considerations, Thyristor Drive Circuits, Power Device Protection in Drive Circuits, Circuit Layout Considerations | |

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|-----------------|--|-------------------|
| | <p>AC-DC Converter: Single phase Semi & Full converters for R, R-L loads, PWM</p> <p>DC/DC Converters: Buck, Boost, Buck-Boost, Forward Converters - Analysis of the Basic Circuit, Resonant Converters, Single ended primary inductor converter (SEPIC), State Space Modeling of DC-DC converters, Power Factor Correction Circuit Design of Switching-Mode Power Supply (SMPS)</p> <p>DC-AC Converter: Single-phase, three-phase, Multilevel inverters Harmonics Elimination/Modulation Techniques</p> | |
| UNIT II | Energy Efficient Methodologies in Electrical Systems | (08 Hours) |
| | <p>Energy monitor of Electrical system: Power supply, Electricity billing, Electrical load management and maximum demand control, Power factor improvement and its benefit, Selection and location of capacitors, Performance assessment of PF capacitors, Distribution and transformer losses. Electric motors: Types, characteristics, losses, efficiency, selection, energy efficient motors, Factors affecting motor performance, Rewinding and motor replacement issues. Energy saving opportunities with Pumps, cooling towers, fans and blowers.</p> <p>Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, soft starters with energy saver, Variable speed drives, Energy efficient transformers, electronic ballast, Occupancy sensors, Energy efficient lighting controls.</p> | |
| UNIT III | Solar Energy Systems | (8 Hours) |
| | <p>Solar Energy: – Solar radiation and measurement – Solar cells and their characteristics – Influence of insulation and temperature – PV arrays – MPPT, Electrical storage with batteries – Solar availability in India – Switching devices for solar energy conversion – Standalone inverters – Charge controllers – Water pumping – Audio visual equipment’s, Street lighting, Analysis of PV systems. Grid connection issues: islanding, storage, protection issues, power and voltage fluctuations, harmonics.</p> | |
| UNIT IV | Wind Energy Systems | (08 hours) |
| | <p>Wind Energy Conversion System: – Power in the wind – components of a wind energy conversion system – Performance of various Generators for WECS – Classification of WECS. LVRT, Modeling of WECS, Grid codes.</p> | |
| UNIT V | Fuel Cells & Its Application | 0(8 Hours) |
| | <p>Fuel cells for automotive applications, technology advances in fuel cell vehicle systems, onboard hydrogen storage, liquid hydrogen and compressed hydrogen, fuel cell control system, alkaline fuel cell, road map to market. Membraneless Microfluidic Fuel Cell.</p> | |

| UNIT VI | Integrated systems | (08 Hours) |
|--|--|------------|
| | Wind / Solar PV integrated systems – selection of power conversion ratio – Optimization of system components – Storage. Modeling of different renewable Integrated systems, Microgrids. Various major software tools required for design, analyze, and optimization of hybrid system: HOMER, RET Screen, PVsyst, iHOGA. Roll of Storage devices in integration of renewable energy sources with the grid. | |
| Continuous assessment: | | |
| The assessment work shall consist of following: <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi, Second Edition, 1994 | | |
| 2. Albert: Plant Engineers & Managers Guide to Energy Conservation | | |
| 3. Wayhe C.Tuner : Energy Management Handbook | | |
| 4. Books of Energy Management & Auditors, Bureau of Energy Efficiency, (A Statutory body under Ministry of Power, Government of India), www.bee-india.nic.in volume I,II,III & I | | |
| 5. Rai G.D., “Non – Conventional Energy Sources”, Khanna Publishers, 1993. | | |
| 6. Rai G.D., “Solar Energy Utilisation”, Khanna Publishers, 1993. | | |
| 7. Daniel, Hunt V, “Wind Power – A Handbook of WECS”, Van Nostrend Co., New York, 1981. | | |
| 8. Gary L. Johnson, “Wind Energy Systems”, Prentice Hall Inc., 1985. | | |
| 9. Freris L. L., “Wind Energy Conversion”, Prentice Hall (UK) Ltd., 1990 | | |
| 10. Hybrid-Renewable Energy Systems in Microgrids, Integration, Developments and Control, 1st Edition - June 2, 2018, This is the Latest Edition, Editors: Hina Fathima, Prabakaran N, Palanisamy K, Akhtar Kalam, Saad Mekhilef, Jackson Justo. eBook ISBN: 9780081024942 | | |
| 11. Integration of Renewable and Distributed Energy Resources in Power Systems, Tomás Gómez San Román and José Pablo Chaves Ávila, ISBN 978-3-03943-487-9 (Hbk); ISBN 978-3-03943-488-6 (PDF), https://doi.org/10.3390/books978-3-03943-488-6 | | |

| Control and Automation | | |
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| EXAMINATION SCHEME: | | CREDITS ALLOTTED: |
| End Semester Examination: 60 Marks | | Total: 04 |
| Continuous Assessment: 40 Marks | | |
| Course Prerequisites: | | |
| The students should have knowledge of | | |
| | Engineering mathematics, Laplace Transform, control systems | |
| Course Objectives: | | |
| 1. | To provide with basic knowledge of state space representation of control systems, non-linear system analysis, associated terminologies. | |
| 2. | To understand the concepts of optimal and robust control, to enable to analyse and design a robust Control System. | |
| 3. | To apply soft computing techniques for control system applications. | |
| Course Outcomes: After learning this course the students will be able to | | |
| 1. | Master Lyapunov's stability theory and its modern control theoretic extensions. Know how to investigate stability for linear systems with static, sector-contained non-linearities. | |
| 2. | Analyse and design a robust control system. | |
| 3. | Analysis, design & implementation of SISO & MIMO systems using state space approach. | |
| 4. | Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution. | |
| 5. | Identify and formulate the needs of different types of controllers and compensator to ascertain the required dynamic response from the system. | |
| 6. | Define and explain the basic properties of multivariable linear systems such as controllability, observability, and transfer functions. | |
| UNIT I | Modeling and Analysis of LTI Systems | (08 Hours) |
| | Modeling of physical Systems. Design specifications and performance indices, Transportation lags. Approximation of time-delay functions. Sensitivity of control systems to parameter variations. Effects of disturbance of signals. Disturbance rejection. Analysis in state-space: A perspective on state-space design. State variables. State models for physical systems. SISO and MIMO systems. Solution of state equations. Transfer function. Eigenvalues and eigenvectors. Jacobian linearization technique. State transformations and diagonalization. Transformation to phase-variable canonical form. Controllability and observability. | |
| UNIT II | Feedback control design | (08 Hours) |

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| | PID controller tuning rules. Two degrees of freedom control systems. Compensator design using Bode diagram in frequency response approach. Lag, Lead, Lag-lead compensator. Control law design for full state feedback by pole placement. Full order observer system. Observer based state feedback. | |
| UNIT III | Optimal and Robust Control | (08 Hours) |
| | Robust Control: Parametric uncertainty and Kharitnov's method for stability test. Stability function, complementary sensitivity function and return difference. Effect of high frequency plant uncertainty. Optimal Control: Linear optimal control with quadratic performance index, Stochastic optimal linear estimation & control. | |
| UNIT IV | Non-Linear Control systems | (08 hours) |
| | Nonlinear system: Classification and types of non-linearity. Phenomena peculiar to non-linear systems. Methods of analysis. Linearization based on Taylor's series expansion. Jacobian Linearization. Phase trajectory and its construction. Phase-plane analysis of linear and non-linear systems. Existence of limit cycles. Describing function of typical non-linearities. Stability analysis by DF method. Introduction to DIDF. Popov's circle criterion. Stability analysis by Lyapunov's indirect and direct methods, Lyapunov's theorem. | |
| UNIT V | Discrete-time Systems | (08 Hours) |
| | Introduction to Discrete-time Systems: Basic elements of discrete-time control system. Z-transform and properties. Inverse Z-transform. Difference equation and its solution by Z-transform method. Z-transfer function. | |
| UNIT VI | Soft computing techniques | (08 Hours) |
| | Fuzzy logic, Artificial Intelligence, Neural Networks, Deep Learning, Machine Learning | |
| Continuous assessment | | |
| The assessment work shall consist of following: | | |
| <ol style="list-style-type: none"> 1. Quiz 2. Numerical 3. Open book test 4. Project based learning | | |
| Text and Reference Books: | | |
| 1. Ogata, K – Modern Control Engineering, PHI Learning | | |
| 2. Kuo, B.C. – Automation Control Systems, Prentice Hall | | |
| 3. Roy Choudhury, D – Modern Control Engineering, Prentice Hall | | |
| 4. Nagrath, J. J. Gopal, M – Control System Engineering, New Age Pub. | | |
| 5. Schulz, D.G. and Melsa, L. – State Functions and Linear Control Systems, McGraw-Hill. | | |
| 6. Stepheni, Shahian, Savant, Hostetler – Design of feedback control systems, Oxford University Press. | | |
| 7. Vidyasagar- Nonlinear system analysis, Prentice-Hall | | |

8. Gopal. M, Modern Control System Theory, New Age International.

9. Gopal. M, Digital Control and State Variable Methods, TMH.

10. Kaushik Kumar, Supriyo Roy, J. Paulo Davim: Soft Computing Techniques for Engineering Optimization, CRC Press

| Paper-III Literature Survey and Presentation | |
|--|-------------------------------------|
| <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Term Work: 100 Marks | Total: 04 |
| <p>Candidate may follow the guidelines mentioned below for completing the requirements of this course.</p> <ul style="list-style-type: none"> • Internal Assessment (Credits: 2) Synopsis Submission (Including Introduction, Literature Review, Research approach/ Methodology, Conclusion) • External Assessment (Credits: 2) Presentation | |

Paper-IV
Research and Publication Ethics

Bharati Vidyapeeth (Deemed to be University)
Institute of Management and Entrepreneurship Development, Pune

BV DU/IMED/687/2021-22

Date: 29th October 2021

To,

Shri G. Jaykumar,
Registrar
Bharati Vidyapeeth (Deemed to be University)
Pune

Subject: Syllabus for PhD Course on Research and Publication Ethics

Respected Sir,

Please find the enclosed here with Syllabus copy of Course on Research and Publication Ethics for Ph. D course work.

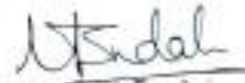
Your's sincerely,



Dr. Sachin S. Vernekar
Dean FMS, BV (DU)
Director-IMED.



Sr. Shashank Joshi
Dean Faculty of Engineering



Dr. Ujawala Bhendale
Dean Faculty of Law

Enclosure: As above

Copy To:

- Hon'ble Prof. Dr. S. F. Patil Executive Director, International Affairs, Research and Training
- Dr. Anthony Rose, I/C COE BV (DU)

Ph.D. Coursework
Paper 04: Research and Publications Ethics (RPE)

Course Title:

Research and Publications Ethics (RPE) – Course for awareness about the publication ethics and publication misconducts.

Credits: 2

Marks: Total Marks 50: (20 IE+30 UE)

Overview:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands –on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h – index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation: Total Marks 50: (20 IE+30 UE)

Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation.

University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.

| Particulars | No of Hours |
|---|-------------|
| Syllabus in detail (Theory) | |
| RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | 4 hours |
| RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | 4 hours |
| RPE 03: Publication Ethics: 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper | 7 hours |

| | |
|---|---------|
| <p>2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc</p> <p>3. Conflicts of interest with copyrights and patents</p> <p>4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types</p> <p>5. Violation of publication ethics, authorship and contributorship</p> <p>6. Dominant laws regarding research ethics</p> <p>7. Infringement and enforcement of Copyright and Patents</p> | |
| <p>Practical</p> <p>RPE 04: Open Access Publishing:</p> <p>1. Open Access Publications and Initiatives</p> <p>2. SHERPA/ RoMEO online resource to check publisher copyright and self – archiving policies</p> <p>3. Software tool to identify predatory publications developed by SPPU</p> <p>4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc.</p> | 4 hours |
| <p>RPE 05: Publication Misconduct:</p> <p>A. Group Discussions (2 hrs.)</p> <p>1. Subject specific ethical issues, FFP, authorship</p> <p>2. Conflicts of interest</p> <p>3. Complaints and appeals: examples and fraud from India and abroad</p> <p>4. Peer review process</p> <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools.</p> | 4 hours |
| <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <p>1. Indexing databases</p> <p>2. Citation Databases: Web of Science, Scopus, etc.</p> <p>3. Open databases</p> <p>B. Research Metrics (3.5 hrs.)</p> <p>1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</p> <p>2. Metrics: h – index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing.</p> | 7 hours |

References:

1. Bird, A. (2006) Philosophy of Science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865
4. National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
5. Resnik, D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
7. <https://doi.org/10.1038/489179a>

8. Indian National Science Academy (INSA). Ethics in Science Education, Research and Governance (2019). ISBN: 978-81-939482-1-7.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
9. Resnik, Shamo: Responsible conduct of Research : Oxford University Press
10. Comstock : Research ethics : Cambridge university Press
11. Robin : Research ethics : Indiana University press
12. Tony Mayer : Promoting Research Integrity in a Global Environment : World Scientific Publishing
13. Paul Oliver : The Student's Guide to Research Ethics : Open University Press
14. Kambadur Muralidhar, Amit Ghosh Anok Kumar Singhvi.: Ethics in Science Education, Research and Governance : Indian National Science Academy
15. David V Thiel : Research methods for Engineers : Cambridge Press
16. Isabella Paoletti, Maria Isabel Tomás and Fernanda Menéndez. (2013). Practices of Ethics: An Empirical Approach to Ethics in Social Sciences Research. Cambridge Scholars Publishing, UK.
17. Bridges David. (2017). Philosophy in Educational Research Epistemology, Ethics, Politics and Quality. Springer International Publishing.
18. Clive Opie (2004). Doing Educational Research - A Guide for First time researchers. New Delhi: Vistar Publications.
19. Dobrick Farina Madita... (et. al) (Ed) (2018). Research Ethics in the Digital Age Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization. Springer VS.
20. Peter Pruzan. (2016). Research Methodology: The Aims, Practices and Ethics of Science. Switzerland. Springer International Publishing.

**BHARATI VIDYAPEETH
DEEMED TO BE UNIVERSITY
COLLEGE OF ENGINEERING, PUNE-43**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

Ref.No. BVDU/COE/ ECE / /2021-22

Date:17/12/2021

Minutes of meeting of the BOS

The Board of Studies meeting was conducted on 14-12-2021 at 11.A.M in offline mode.

The following members of the board were present:

1. Dr. R. B. Ghongade : Chairman
2. Dr. A. A. Shinde : Member
3. Dr. S. K. Oza : Member
4. Dr. N. T. Markad : Member
5. Dr. S. P. Gaikwad : Member
6. Dr. M. V. Patil : Member
7. Dr. V. H. Patil : Member

The following points were discussed in the meeting: -

1. Warm welcome was extended to all members by the Chairman, BOS.
2. Review of the last meeting was taken.
3. The final structure for PhD coursework for academic year 2022-23 was discussed.
4. The BOS members suggested to add prerequisites, objectives and assignments in each course.
5. The contents of each course were discussed in detail. The committee members requested to review and modify the course contents by including latest topics in VLSI Design, Electronics Communication and Signal & Image processing courses.
6. Revised course contents to be prepared on a priority basis by the respective faculty.
7. The following documents are to be submitted to Bhavan before 15th Jan 2022.
 - a. Equivalence between CBCS 2007 course & CBCS 2014 Course.
 - b. Equivalence between CBCS 2020 course & CBCS 2021 Course.



Dr. R. B Ghongade
Chairman, Board of Studies,
(Electronics & Communication Enng., Electronics & Telecommunication Engineering)
Bharati Vidyapeeth Deemed to be University, College of Engg. Pune.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
Ph. D. Entrance Test Syllabus

Specific Subject:-Electronics Engineering

Topics covered

| | |
|-----------------|--|
| UNIT-I | Signals and Systems: Linear Algebra, Calculus, Differential Equations, Complex variables, Continuous and Discrete Time Systems, z-transforms, Continuous and Discrete time Fourier transforms, Continuous and Discrete time Fourier series, Random signal and noise. |
| UNIT-II | Analog and Digital Electronics: Diode Circuits, Basic BJT and FET circuits, Amplifiers, Op Amps, Integrated Circuits, Number System and Boolean Algebra, Combinational Logic Circuits, Sequential Circuits, Digital Systems. |
| UNIT-III | Network Theory and Control System: Circuit Theorems, RLC circuits, Solution of network equations using Laplace transform, Two port networks, Frequency response, Transfer functions, Stability, Time response, Frequency domain analysis, LTI control systems. |
| UNIT-IV | Micro controllers and Embedded system: Architecture of Micro controller, Memory organization, Interrupt structures for PIC microchip16F, 18F series. |
| UNIT-V | Analog and Digital Communication: Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, Fundamentals of AM/FM/PM, Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), Basics of TDMA, FDMA and CDMA and GSM. |

Text Books/References:

| | |
|-----|---|
| 1. | S K Mitra, Van Nostrand Reinhold, DSP: A computer- based approach, TMH |
| 2. | John G Proakis and Dimitris. G. Manolakis, Digital Signal Processing, Prentice Hall of India, 1997 |
| 3. | Duda R.O. and Hart P.E., John, Pattern Classification and Scene Analysis, Wiley Interscience, 1973. |
| 4. | R.C. Gonzalez and P. Wintz, Digital Image Processing, Addison Wesley, 2nd Ed, 1987 |
| 5. | Rosenfeld and A. C. Kak, Digital Image Processing Academic Press, Vol-1, 1982. |
| 6. | Douglass BP, Real time UML: Developing Efficient Objects for Embedded Systems, Addison Wesley, 2000 |
| 7. | A.S. Taanenbaum, Computer Networks, PHI/PEA, 4th Ed, 2003 |
| 8. | Douglas Comer, DL Stevens, Internetworking with TCP/IP, Vol III, PEA, 2nd Ed, 1996 . |
| 9. | Garg V, Joseph E. Wilkes, Wireless & Personal Communication Systems, Feher/Prentice Hall. |
| 10. | R. S. Khandpur, Handbook of Biomedical Instrumentation, McGraw Hills. |
| 11. | Timothy J Ross, Fuzzy logic with Engineering Applications, McGraw Hills, 1997. |

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|-----|---|
| 12. | Mehrotra, Mohan, Ranka, Elements of Artificial Neural Networks, MIT Press, 1997. |
| 13. | Munakata, Fundamentals of New Artificial Intelligence, Springer Verlag, 1998 |
| 14. | F.O Karray, CW DeSilva, Soft Computing & Intelligent Systems, Addison Wesley, 2005 |
| 15. | D. L. Perry, 'VHDL', Mc Graw Hill Inc., 1998. |
| 16. | Frank Vahid and Tony Givargis, "Embedded system design: unified hardware/software introduction", John Wiley & Sons, 2002. |
| 17. | Neil Weste, David Harris, "CMOS VLSI Design: A circuit and system perspective," 4th edition, Person Publication. |
| 18. | Myer Kutz, "Standard Handbook of Biomedical Engineering Design", MGH. |
| 19. | Webster, "Encyclopedia of Medical Devices and Instrumentation", Wiley Interscience |
| 20. | Andrew Sloss, Dominic Symes, Chris Wright, " ARM system developer's guide Designing and izing System software, Morgan Kaufmann Publishers, 2010. |
| 21. | Robert Ashby, "Designers guide to Cypress PSoC", Elsevier Publications. |
| 22. | Kaushik Roy, Sharat Prasad, Low Power CMOS VLSI Design., John Wiley and Sons. |
| 23. | Aswin Sreedhar, Sandip Kundu, Nanoscale CMOS VLSI Circuits Design for Manufacturability , MGH. |
| 24. | Erwin Kreyszig, Advanced Engineering Mathematics, Laurie Rosatone |
| 25. | Vijay Garg, Wireless communication and networking, Morgan Caufmann |
| 26. | William Stallings, Wireless Communications and Networks, PHI |
| 27. | B. V. Ramna, Higher Engineering, Tata McGraw Hills |

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Department of Electronics Engineering
Pre-PhD Course Work- Structure and Syllabi

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|------------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Electronics Engineering* | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 08 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 02 | 02 | 30 | 20 | - | 50 | 02 | - | 02 |
| Total | | 10 | 10 | 150 | 100 | 100 | 350 | 10 | 04 | 14 |

*Programme Specific Course: (Any one to be opted)

1. Artificial Intelligence & Machine Learning
2. Signal and Image Processing
3. Electronic Communication
4. VLSI

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral :- |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | PRELIMINARY MATHEMATICS Vectors and Matrices, Quadratic Forms and Definite Matrices, Time-Varying and Gradient Vectors, Jacobian and Hessian Matrices, Solution of Optimization Problems, Stability of Nonlinear Dynamical Systems, Analytic Geometry in Euclidean Space in Cartesian Coordinates ,Set Theory, Operation on sets | (8 Hours) |
| UNIT-II | ARTIFICIAL NEURAL NETWORKS-I Biological neuron , Artificial neuron model, concept of bias and threshold, Mc Culloch-Pits Neuron Model , implementation of logical AND, OR, XOR functions ,Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary , bipolar (linear, signum, log sigmoid, tan-sigmoid) ,Learning mechanisms: Hebbian, Delta Rule, Perceptron and its limitations, Multilayer perceptron (MLP) and backpropagation algorithm, Application of MLP for classification and regression | (8 Hours) |
| UNIT-III | ARTIFICIAL NEURAL NETWORKS-II Self-organizing Feature Maps, k-means clustering ,Learning vector quantization , Radial Basis Function networks: Cover's theorem, mapping functions(Gaussian, Multi-quadrics, Inverse multi-quadrics, Application of RBFN for classification and regression, Hopfield network, associative memories, Boltzmann machine | (8 Hours) |
| UNIT-IV | DEEP LEARNING Concept of deep neural networks, Convolutional Neural Networks (CNNs),Long Short Term Memory Networks (LSTMs),Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs) | (8 Hours) |
| UNIT-V | GENETIC ALGORITHMS Concept of genetic evolution, parent, child, chromosome, mutation from biological perspective, Comparison of Biological and GA Terminology , Robustness ,Non-integer Unknowns, Multi-parameter Problems, Mutation, Selection, Elitism ,Crossover, Initialization, Advanced Operators: Combinatorial Optimization, Locating Alternative Solutions using Niches and Species Constraints ,Multi-criteria Optimization Hybrid Algorithms, Alternative Selection Methods, Alternative Crossover Methods ,Considerations of Speed | (8 Hours) |

| | | |
|---|--|------------------|
| UNIT-VI | SUPPORT VECTOR MACHINES Concept of maximum margin classifiers and support vectors, Risk Minimization Principles and the Concept of Uniform Convergence ,The VC Dimension, Structural Risk Minimization ,Support Vector Machine Algorithms ,Linear Maximal Margin Classifier for Linearly Separable Data ,Linear Soft Margin Classifier for Overlapping Classes, The Nonlinear Classifier ,Proximal Support Vector Machines , Support vector machines for regression and classification | (8 Hours) |
| Assignments: (Using MATLAB or Equivalent software) | | |
| 1. | Implement logic gates using Culloch-Pits Neuron Model | |
| 2. | Implement perceptron network for emulating the behaviour of AND , OR logic gates | |
| 3. | Implement backpropagation algorithm for emulating XOR gate | |
| 4. | Implement MLP for two class classification | |
| 5. | Implement MLP for regression | |
| 6. | Implement k-means clustering algorithm | |
| 7. | Implement RBFN for two class classification | |
| 8. | Implement RBFN for regression | |
| 9. | Mini-project based on genetic algorithm | |
| 10. | Mini-project based on deep learning networks | |
| Text Books/References: | | |
| 1. | Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991 | |
| 2. | Neural Networks-A comprehensive foundation, Simon Haykin, Prentice Hall International Inc.,1999 | |
| 3. | Learning and Soft Computing-Support Vector Machines, Neural Networks, and Fuzzy Logic Models, Vojislav Kecman, The MIT Press,2001 | |
| 4. | Genetic Algorithms in Search, Optimization, and Machine Learning, David Goldberg, Addison Wesley, 1989 | |
| 5. | Pattern Classification, Peter E. Hart, David G. Stork Richard O. Duda, Second Edition , 2000 | |
| 6. | Deep Learning for Dummies, John Paul Mueller (Author), Luca Massaron, Wiley ,2019 | |
| 7. | Introduction to Deep Learning, Eugene Charnaik, MIT Press, 2018 | |
| 8. | Machine Learning for Dummies, John Paul Mueller (Author), Luca Massaron, Wiley ,2018 | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
FACULTY OF ENGINEERING AND TECHNOLOGY

Ph.D. Course-work Syllabus

Sub: Bio-Signal and Image Processing

| Teaching Scheme | | Examination Scheme | | Credits Allotted | |
|------------------------|----------------|---------------------------|------------|-------------------------|------|
| Lectures | : 4 Hours/Week | End Semester Examination | :60 Marks | Theory | : 04 |
| Tutorial | : - Hours/Week | Internal Assessment | :40 Marks | Practical/ Oral | :- |
| Total | : 4 Hours/Week | Total | :100 Marks | Total Credits | : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | <p>Introduction to Signal Processing A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Circular Correlation – Filtering methods based on DFT – FFT Algorithm, z-transform, Filtering, various transforms, System design and Implementation issues, Introduction to Discrete Cosine Transform , DSP architectures</p> | (8 Hours) |
| UNIT-II | <p>Digital Speech Processing Fundamentals of Digital Speech Processing, Time Domain Models for Speech Processing, Spectral Analysis of Speech: Formant Frequency, Fundamental Frequency, Synthesis of Pole-Zero Speech Models, Linear Prediction of speech signal analysis. Speech Enhancement: Speech enhancement techniques: Single Microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multimicrophone Approach, Automatic speech recognition and synthesis techniques, Speaker recognition algorithms, trade-offs and implementation issues.</p> | (8 Hours) |
| UNIT-III | <p>Digital Imaging Basic steps of Image Processing System Sampling and Quantization of an image, Image Transforms: 2 D- Discrete Fourier Transform, Wavelet Transform. Sensor array processing and imaging: ambiguity function, range-Doppler radar, reconstruction of signals from projections, tomography, synthetic aperture radar, radio astronomy, beam forming sonar.</p> | (8 Hours) |
| UNIT-IV | <p>Image Enhancement Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing, spatial filters, Sharpening spatial filters, Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering, Image segmentation, Evaluation issues in segmentation: Supervised & Unsupervised evaluation, Applications.</p> | (8 Hours) |
| UNIT-V | <p>Image Compression Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, Arithmetic coding, LZW coding, Run length coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, JPEG Standards, Image restoration.</p> | (8 Hours) |

| | | |
|-------------------------------|--|------------------|
| UNIT-VI | Fundamentals of Biomedical Sensing Bioelectric phenomena - Origin of bio-potentials - Biopotential measurements – ECG, EEG, EMG, ERG, ENG - Chemical biosensors – electrochemical sensors and chemical fibro-sensors - Fundamentals of light propagation in biological tissue – Biophysical measurement techniques using light – photoplethysmography – Acoustic biosensors – phonocardiography - Photoacoustic bio-signals – estimation of blood glucose. | (8 Hours) |
| Assignments: | | |
| 1. | Identify the research areas in speech Processing and Image Processing. | |
| 2. | Study of automatic speaker identification systems. | |
| 3. | Study of speech enhancement techniques. | |
| 4. | Image sharpening using high pass filter in frequency domain. | |
| 5. | Study of Histogram of image and Histogram equalization. | |
| 6. | Explore Image Enhancement using Spatial Domain filter. | |
| 7. | Image Compression Coding Technology. | |
| 8. | Study of Image segmentation techniques. | |
| 9. | Study of color image processing. | |
| 10. | Study of Computed Tomography. | |
| 11. | Study of any biosensing device. | |
| Text Books/References: | | |
| 1. | Digital processing of speech signals – L. R. Rabiner and S.W. Schafer, Pearson Education. | |
| 2. | Douglas O’Shaughnessy, Speech Communications: Human & Machine, IEEE Press. | |
| 3. | Gonzalez and Woods, Digital Image Processing, Pearson. | |
| 4. | A K Jain, Fundamentals of Digital Image Processing, Pearson 2004. | |
| 5. | S. Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, Tata McGraw Hill, 2011. | |
| 6. | Myer Kutz, Standard Handbook of Biomedical Engineering Design, MGH. | |
| 7. | R. Begg, D.T.H. Lai, M. Palaniswami, “Computational Intelligence in Biomedical Engineering”, CRC Press, 2008. | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II****Electronics Communication Engineering**

| Teaching Scheme | Examination Scheme | Credits Allotted |
|-------------------------|------------------------------------|-------------------------|
| Lectures : 4 Hours/Week | End Semester Examination :60 Marks | Theory : 04 |
| Tutorial : - Hours/Week | Internal Assessment :40 Marks | Practical/ Oral : |
| Total : 4 Hours/Week | Total :100 Marks | Total Credits : 04 |

Topics Covered

| | | |
|-----------------|---|------------------|
| UNIT-I | Microwave and Antenna Microwave components, amplifier design, plane waves at a media interface, waveguides, dielectric wave guide, radiation, arrays, propagation of radio waves, microwave antenna, antenna measurement, open ranges, Anechoic chamber, compact ranges, near field and far field measurements, computational electromagnetic methods. | (8 Hours) |
| UNIT-II | Mixed Signal Analysis Signal integrity, techniques, equivalent models, characteristics, limitations, mixed signal processing, simulation, physical parameters. Modelling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various applications. | (8 Hours) |
| UNIT-III | Wireless & Broadband Communication IEEE/ITU/ ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae, and frontend design issues, Performance issues, Network architectures, Security algorithms with their performance measures. | (8 Hours) |
| UNIT-IV | RF Systems RF amplifier, mixer and local oscillator designs, Advanced filter designs, amplifiers, Transmission line design, Design challenges in satellite frequency bands, characteristics, mathematical models, power relations, stability considerations, stability circles, unconditional stability stabilization methods & designs. | (8 Hours) |
| UNIT-V | Wireless Communication and Networks Computer simulation of radio channels, Overview of 4G-LTE networks, IP switching and MPLS- Overview of IP over ATM and its evolution to IP switching, State of art of OFDM and MIMO, Optical communication networks- DWDM based network, Optical network on chip, Introduction to near field communication, LoRa communication | (8 Hours) |

| | | |
|------------------------------|--|------------------|
| UNIT-VI | Coding and Modulation Techniques in Communication Digital communication system architectures, Source coding, Channel coding, Performance measures of communication systems, PLD based system implementations and related issues. | (8 Hours) |
| Textbooks/References: | | |
| 1 | William Stallings, Wireless Communications and Networks, PHI | |
| 2 | Theodore S. Rappaport, Wireless Communications: Principles and Practice, 2e 2002, Prentice Hall. | |
| 3 | Liao SY, Microwave Devices and Circuits, 1987, 2e, Prentice Hall of India | |
| 4 | Miligan TA, Modern Antenna Design, Jun 2005, 2e, McGraw Hill | |
| 5 | Jochen Schiller, Mobile Communication, 2e, PEA, 2003 | |
| 6 | Data and computer communications by william stallings | |
| 7 | Data Communication and Networking by Achyut Godbole | |
| 8 | Antennas and Wave Propagation by John Kraus and Ronald J. Marhefka and Ahmad S. Khan | |
| 9 | Antennas Wave Propagation by U A Bakshi | |
| 10 | Simon Haykin, Michael Moher, An Introduction to Analog and Digital Communications, 2nd Edition, Wiley Publications | |

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**FACULTY OF ENGINEERING AND TECHNOLOGY****Ph.D. Course-work Syllabus****Paper-II
VLSI Design**

| Teaching Scheme | | Examination Scheme | | Credits Allotted | |
|------------------------|----------------|---------------------------|------------|-------------------------|------|
| Lectures | : 4 Hours/Week | End Semester Examination | :60 Marks | Theory | : 04 |
| Tutorial | : - Hours/Week | Internal Assessment | :40 Marks | Practical/ Oral | :- |
| Total | : 4 Hours/Week | Total | :100 Marks | Total Credits | : 04 |

Topics Covered

| | | |
|-----------------|--|------------------|
| UNIT-I | Digital VLSI Design CMOS Inverters, Inverter Design with Delay constraints, Combinational CMOS Logic Circuit, CMOS TG, Sequential CMOS Logic Circuit, Dynamic Logic circuit | (8 Hours) |
| UNIT-II | Analog VLSI Design MOS Subcircuits: MOS Switch, MOS Diode, Current Sinks and Sources, Current Mirrors, References, Basic CMOS Amplifier: Inverting, Differential and Cascode, CMOS OP AMP Design | (8 Hours) |
| UNIT-III | Mixed mode VLSI Design Comparator Specifications, OP AMP as a Comparator, Latched Comparator, Data Converter Specifications, Overview of Nyquist rate Data Converter, Oversampling Data Converters | (8 Hours) |
| UNIT-IV | Low Power CMOS VLSI Design Overview of Power Consumption, Low Power Techniques: at Device Level, Circuit Level, Logic level and Architecture Level | (8 Hours) |
| UNIT-V | High Speed VLSI Design Impact of Scaling, Modeling and Optimization of VLSI Interconnect, Complementary GaAs Technology for High-Speed VLSI Circuits, Current mode Techniques for High-Speed VLSI Circuits | (8 Hours) |
| UNIT-VI | Deep submicron VLSI Design Deep Submicron CMOS transistor theory, Deep Submicron CMOS Circuit Fabrication, Silicon-on-Insulator Technology, Single-Electron Transistors, Carbon Nanotubes, Quantum Dots, Spintronics | (8 Hours) |

Reference books:

1. Principles of CMOS VLSI Design : A Systems Perspective by N H E Weste and K Eshraghian
2. CMOS Circuit Design, Layout and Simulation by R Jacob Baker and H.W.Li
3. Analog and Mixed Mode Vlsi Design by Gejji Vineeta P. PHI Publications

| | |
|----|---|
| 4. | Low-Power Digital VLSI Design: Circuits and Systems Paperback by by Abdellatif Bellaouar, Mohamed Elmasry |
| 5. | VLSI Physical Design From Graph Partitioning to Timing Closure by Andrew B. Kahng, Jens Lienig, Igor L. Markov, Jin Hu , Springer |
| 6. | |
| 7. | |
| 8. | |
| 9. | |



Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Chancellor

Prof. Dr. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor

Bharati Vidyapeeth
(Deemed to be University)
Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

- ★ Accredited with 'A' Grade (2017) by NAAC ★
- ★ Category-I University Status by UGC ★
- ★ NIRF Ranking - 63 ★

"Social Transformation Through Dynamic Education"



Dr. Vishwajeet Kadam
B.Tech., M.T.A., Ph.D.
Pro Vice Chancellor
G. Jayakumar
M.Phil., Ph.D.
Registrar

NOTICE OF MEETING

A meeting of the Board of Studies in Mechanical and Production Engineering will be held 29th March 2022 at 11.00 a.m. in the BVDU's College of Engineering, Pune - Satara Rd, Pune - 43.

You are requested to make it convenient to attend the meeting.

The agenda of the meeting is given below.

Ref. No. BVDU/AIS/~~487~~/2021-2022

Date : March 23, 2022

G. Jayakumar
REGISTRAR

Note.- Prior permission is necessary for travel by Car.

Agenda

1. Confirmation of minutes of the previous meeting.
2. Restructuring the structure of course 2020 for B.Tech. Mechanical Engineering and B.Tech. Robotics Automation.
3. Syllabus of Ph.D. Nanotechnology.
4. Any other item with permission of the chair.

To,

1. Dr. S. S. Chavan Chairman,
Professor, College of Engineering, Pune - 43.
2. Dr. P. V. Jadhav Professor, College of Engineering, Pune - 43.
3. Dr. K. B. Sutar Associate Professor, College of Engineering, Pune - 43.
4. Dr. V. K. Kurkate Associate Professor, College of Engineering, Pune - 43.
5. Dr. D. B. Jadhav Assistant Professor, College of Engineering, Pune - 43.
6. Mr. U. S. Pawar Assistant Professor, College of Engineering, Pune - 43.
7. Mr. Digambar Parkale General Manager M/S. Century Enka, Pune.
8. Dr. Ratnakar Ghorpade Professor, MIT WPU, Kothrud, Pune - 38.

Bharati Vidyapeeth
(Deemed to be University) Pune
Board of Studies in Mechanical, Production and Robotics & Automation Engineering

A meeting of Board of Studies in Mechanical & Production Engineering was arranged on 29th March, 2022 at Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune.
Following faculty members

| Sr. No. | Name of Faculty/ Expert | Designation | Organization |
|---------|-------------------------|---------------|---------------------------------------|
| 1 | Dr. S. S. Chavan | Chairman | BVDUCOE, Pune |
| 2 | Dr. K. B. Sutar | Member | BVDUCOE, Pune |
| 3 | Dr. P.V. Jadhav | Member | BVDUCOE, Pune |
| 5 | Dr. D. B. Jadhav | Member | BVDUCOE, Pune |
| 6 | Prof. U. S. Pawar | Member | BVDUCOE, Pune |
| 7. | Dr.R.R. Ghorpade | Co-opt Member | Professor MIT WPU Kothrud Pune |
| 8. | Mr. Digambar Parkale | Co-opt Member | General Manager M/S Century Enka Pune |

Minutes of Meeting

Welcome to all members of BoS Mechanical & Production Engineering

Resolution

- Dr. Sachin Chavan Chairman welcome all BOS member and two newly co-opt members Dr. R. R. Ghorpade, Mr. Digambar Parkale for meeting of academic year.

Agenda

Confirmation of minutes of previous meeting.

Resolution

It was resolved that the minutes of previous meeting held on 22nd Sept. 2021 be confirmed.

Amendments in the course structure of CBCS 2020 course for B. Tech. Mechanical Engineering and B. Tech. Robotics & Automation.

Resolution

Amendments were done as per the requirements of student and faculty members. Details are mentioned in Annexure 01.

Syllabus of Course work Ph. D. Nanotechnology.

Resolution

Course work Syllabus for course specific was prepared and approved. Details in Annexure 02

Any other item with permission of the chair

**Eligibility for Ph. D. Nanotechnology
Resolution**

He was recommend by all the members that eligibility for Ph.D Nanotechnology must be M.Tech (All Branches) and M.Sc (All Branches)

Annexure I

With reference to the above subject, we in the department of Mechanical Engineering are facing following administrative difficulties in implementation of CBCS 2020 Course curriculum for the two programmes viz. B. Tech. Mechanical, B. Tech. Robotics & Automation:

1. Student had experienced too much load per semester and by faculty to administer the same. Therefore, it was decided to reduce credits from 230 to 200 in the new curriculum course structure
2. Difficulty in Implementation of 'MOOC courses' as compulsory part of the course structure, as completion of MOOC course by all the students in respective semesters is very difficult. So three MOOC courses are being keep as optional course with 02 credits each, total 04 credits.
3. Maintaining the quality of teaching by the industry experts while teaching Industry taught and vocational courses
4. Difficulty in conducting Project-I Stage-I and Project-I Stage-II in sem. V and VI respectively as the students will not be getting sufficient knowledge to perform these activities in these semesters. So only Project Stage I and II are been kept in Sem. VII and VIII.
5. Difficulty in Implementation of 'social activities' and 'Writing of a research paper' as compulsory part of the course structure as it is difficult to maintain the records of the students of same. So two social activities and research paper writing are being keep as optional with 02 credits each, total 06 credits.
6. Difficulty in conducting Internship in Sem. VI. The practical period after Sem V is insufficient for completion of internship, therefore internship must be shifted to Sem VII.

The new course structure is attached herewith.

Annexure II

Structure the syllabus as per directives of UGC for Ph.D (Nanotechnology) Pre-Ph.D Course Work

Resolution:

1. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|---------|----------------------|------------------------------|---|----------------------------|----|-------|-------|---------|---|-------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |

| | | | | | | | | | | |
|--------------|---|-----------|-----------|------------|-----------|------------|------------|-----------|-----------|-----------|
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

Research Methodology: The following Research Methodology syllabus was revised and approved by members

| | | |
|---|---|---------------------------------|
| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
| Paper-I Research Methodology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> • begin to formulate researchable problem in areas of research interest; • write an effective research proposal or report; • make appropriate choices about research strategies; • review literature judiciously and systematically; • understand and begin to apply the principles of collecting research data; • understand and begin to conduct appropriate analyses of data; • make appropriate choices about quantitative methods; • demonstrate sensitivity to ethical issues raised by researchers; | | |
| Topics Covered | | |
| UNIT-I | Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research. Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc. | (8 Hours) |

| | | |
|-----------------|---|------------------|
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | (8 Hours) |

Assignments:

| | |
|----|--|
| 1. | Identify and write the research gap areas based on the literature review. |
| 2. | Use Mendeley or similar software and list the references in a report. |
| 3. | Define a research problem and mention the scope and objectives of your research topic. |
| 4. | Determine the limitations and assumptions of the identified research problem. |
| 5. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. |
| 6. | Develop a research report based on your research area. |
| 7. | Prepare effective power point presentation based on your research report. |

| | |
|-------------------------------|--|
| 8. | Present your research topic to the research committee. |
| 9. | Design a review paper based on literature review carried out by you. |
| 10. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. |
| 11. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. |
| Text Books/References: | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 |
| 4. | S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972 |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 |

02.Program Specific Course: Nanotechnology

Credits:04

| | | |
|--|-------------------------------|--------------------------|
| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Nanotechnology Engineering | | |
| Subject: Nanotechnology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |

| | | |
|-------------------|---|-------------------|
| UNIT – I | Basics of Nanoscience Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene's and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties | (06 Hours) |
| UNIT – II | Synthesis of Nonmaterial's Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation. Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method | (06 Hours) |
| UNIT - III | Nanomaterials characterization Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy | (06 Hours) |
| UNIT - IV | Sustainable Nanotechnology: Application of industrial ecology to nanotechnology, Fate of nanomaterials in environment, environmental life cycle of nano materials, environmental and health impacts of nano materials, toxicological threats, eco-toxicology, exposure to nano particles – biological damage, threat posed by nano materials to humans, environmental reconnaissance and surveillance. Corporate social responsibility for nanotechnology, Nano materials in future - implications. | |
| UNIT - V | Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology. | (06 Hours) |
| UNIT - VI | Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method. | (06 Hours) |

| Text Books/Reference Books: | |
|------------------------------------|---|
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 |
| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. |
| 5 | 5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films |
| 9 | Liu,Hand Book of Advanced Magnetic Materials (4 Vol.) |
| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced. The following syllabus is prepared and approved by members.

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
|--|---|--------------------------|
| Paper-IV | | |
| Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview: This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy: Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE) Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | RPE 02: Scientific Conduct: 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |

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|------------------------------------|---|-------------------|
| UNIT - III | RPE 03: Publication Ethics 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | RPE 04: Open Access Publishing 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | (08 Hours) |
| UNIT - V | RPE 05: Publication Misconduct A. Group Discussions (2 hrs.) 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad 4. Peer review proces B. Software Tools (2 hrs.) Use of plagiarism software like Turnitin, Urkund, cross check, plagscan, Crossref and other open source software tools. | (08 Hours) |
| UNIT - VI | RPE 06: Database and Research Metrics: A. Databases (3.5 hrs.) 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases B. Research Metrics (3.5 hrs.) 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird, A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics. London. | |
| 3 | P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |
| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. | |

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|---|---|
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |

Course Structure and Syllabus for PhD in Mechanical Engg.

Structure the syllabus as per directives of UGC for Ph.D (Nanotechnology) Pre-Ph.D Course Work

Resolution:

1. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

1. Syllabus for PhD in Mechanical Engg.

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
|---|---|--------------------------|
| Paper-I Research Methodology | | |
| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> • begin to formulate researchable problem in areas of research interest; • write an effective research proposal or report; • make appropriate choices about research strategies; • review literature judiciously and systematically; • understand and begin to apply the principles of collecting research data; • understand and begin to conduct appropriate analyses of data; • make appropriate choices about quantitative methods; • demonstrate sensitivity to ethical issues raised by researchers; | | |

| Topics Covered | | |
|-----------------------|--|------------------|
| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report.</p> <p>Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes.</p> <p>Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | <p>Publishing of research work</p> | (8 Hours) |

| | | |
|-------------------------------|---|--|
| | <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | |
| Assignments: | | |
| 12. | Identify and write the research gap areas based on the literature review. | |
| 13. | Use Mendeley or similar software and list the references in a report. | |
| 14. | Define a research problem and mention the scope and objectives of your research topic. | |
| 15. | Determine the limitations and assumptions of the identified research problem. | |
| 16. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 17. | Develop a research report based on your research area. | |
| 18. | Prepare effective power point presentation based on your research report. | |
| 19. | Present your research topic to the research committee. | |
| 20. | Design a review paper based on literature review carried out by you. | |
| 21. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 22. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

| <p style="text-align: center;">BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus</p> | | |
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| <p>Paper-III Specific Subject: Mechanical Engineering</p> <p>Subject: Design Engineering</p> | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3Hrs | |
| Topics covered | | |
| UNIT-I | <p>Elasticity Components of stresses, Equations of Equilibrium, Specification of stress at a point. Stress invariants, Principal stresses and shear stresses and Mohr's diagram in three dimensions. Octahedral stresses, Decomposition of state of stress, Deformation, Strain Displacement relations, Strain components, State of strain at a point, Principal strain, Strain transformation, Compatibility equations, Generalized Hooke's law in terms of engineering constants</p> | (08 Hours) |
| UNIT-II | <p>Vibration Basic concepts, Free vibration of single degree of freedom systems with and without damping, forced vibration of single DOF-systems, Natural frequency., Transient Vibration of single Degree-of freedom systems, Impulse excitation, Arbitrary excitation, Laplace transform formulation, Pulse excitation and rise time, Shock response spectrum, Shock isolation vibration instruments, vibration exciters, transducers and measurement devices, analyzers.</p> | (08 Hours) |
| UNIT-III | <p>Computer Aided Design Geometric transformations-2D and 3D translation, scaling, rotation, shear and reflection Homogeneous transformations Types of mathematical representation of curves, Wire frame models wire frame entities Parametric representation of synthetic curves, Hermit cubic splines, Bezier curves.</p> | (08 Hours) |

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| | Surface Modeling: Mathematical representation surfaces, Surface model, Surface entities surface representation Parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder. | |
| UNIT-IV | <p>Finite element Method</p> <p>Virtual energy principle, Rayleigh- Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain displacement relations.</p> <p>1-D structural problems – axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape function. Analysis of Trusses – Plane Truss and Space Truss elements.</p> <p>Analysis of beams – Hermite shape functions – stiffness matrix – Load vector – Problems 2-D problems –CST, LST, force terms, Stiffness matrix and load vector</p> | (08 Hours) |
| UNIT-V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate, and final. Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (08 Hours) |
| UNIT-VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (08 Hours) |

Text Books/References:

| | |
|----|---|
| 1. | W. Strunk Jr., E.B. White, The Elements of Style, fourth ed., Longman, New York, 2000 |
| 2. | Anderson T. L, Fracture Mechanics-Fundamentals and Application CRC Press, 3rd Edition 2005. |
| 3. | Ralph Stephens, Ali Fatemi, Robert Stephens, Henry Fuchs Metal Fatigue in Engineering, John Wiley, Second edition. 2001 |
| 4. | L. S. Srinath Advanced Mechanics of Solids, Tata McGraw Hill, 2009. |
| 5. | W. T. Thomson , Theory of vibration with applications:- (PHI) |
| 6. | Ibrahim Zeid& R.Sivasubramanian, CAD/CAM Theory and Practice by, Tata Mc Graw Hill international. |
| 7. | Tirupathi K. Chandrupatla and Ashok D.Belegundu., Introduction to finite elements in engineering |

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| 8. | Nitin S. Gokhale, Sanjay S. Deshpande, Sanjeev V. Bedekar and Anand N. Thite, Practical Finite Element Analysis. Finite to Infinite, Pune. |
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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering Subject: Thermal Engineering | | |
| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3Hrs. | |
| Topics covered | | |
| UNIT-I | Computational Fluid Dynamics Dimensionless form of equations; Simplified mathematical models; Hyperbolic, Parabolic & Elliptic systems; Properties of numerical solutions (Consistency, Stability, Conservation, Convergence and Accuracy). Heat and Mass transfer Problems; Multi Phase Flows, laminar and turbulent flow modeling. | (08 Hours) |
| UNIT-II | Advanced Heat Transfer Overview of the subject of heat transfer with orientation to applications, Analytical solutions for temperature distribution, Problems related to anisotropic materials, Transient Conduction, Principle of Fluid flow and Convective heat transfer. Concept of velocity and thermal boundary layers, Navier-Stokes equations and convection equation, Boundary layer approximations and special conditions, Reynolds analogy, Chilton-Colburn analogy, mixed convection heat transfer. | (08 Hours) |
| UNIT-III | Introduction to Combustion Combustion Reactions, Enthalpy of formation. Entropy of formation, Reference levels of tables. Energy of formation, Heat of reaction, Adiabatic flame temperature generated product, Enthalpies, Equilibrium. Chemical equilibrium of ideal gases, Effect of non-reacting gases equilibrium in multiple reactions, The chemical potential and phase equilibrium. The Gibb's phase rule. | (08 Hours) |
| UNIT-IV | Renewable Energy Systems | (08 Hours) |

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| | <p>Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.</p> <p>Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.</p> <p>Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, solar thermal power plants, thermal energy storage for solar heating and cooling</p> <p>Principle of working of various types of fuel cells and their working, performance and limitations.</p> <p>Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors.</p> <p>Bio-mass: Availability of bio-mass and its conversion theory.</p> <p>Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.</p> <p>Wave and Tidal Wave: Principle of working, performance.</p> | |
| UNIT-V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate, and final. Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (08 Hours) |
| UNIT-VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (08 Hours) |
| Text Books/References: | | |
| 1. | Thermodynamics. Sonntag & Van Wylen. John Wiley & Sons | |
| 2. | Thermodynamics for Engineers/Doolittle-Messe / John Wiley & Sons | |
| 3. | Fundamentals of Heat and Mass Transfer-5thEd.Frank P. Incropera. John Wiley | |
| 4. | Heat Transfer. J.P Holman McGraw-Hill Book Company | |
| 5. | Fluid Mechanics. FM White. Boston: McGraw-Hill Book Company | |
| 6. | Boundary Layer Theory. Schlichting H. Springer Publications | |
| 7. | Computational Fluid Dynamics-The Basics with Applications. John D. Anderson, Jr., McGraw-Hill, Inc. New York. | |

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| 8. | Thermal System Design & Simulation. P. L. Dhar. Academic Press |
| 9. | Design & Simulation of Thermal Systems. N. V. Suryanarayana. McGraw-Hill. |
| 10. | Introduction to Combustion: Concepts & Applications. S. R. Turns. McGraw-hill. |
| 11. | Textbook of Renewable Energy. S. C. Bhatia, R. K. Gupta. Woodhead Publishing India PVT. Limited, 31-Jan-2019 |
| 12. | Introduction to Renewable Energy Technologies in India. Nasir UI, Rasheed Rather. Educreation Publishing (10 May 2018) |

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering Subject: Manufacturing Engineering | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| | Duration : 3 Hrs. | |
| Topics covered | | |
| UNIT-I | Advanced Machining Processes General classification of unconventional machining processes; Abrasive jet machining, water jet and abrasive water jet machining, ultrasonic machining; Electric discharge machining and allied processes, laser beam machining, ion beam machining, plasma arc machining; Electro-chemical machining (ECM) and allied processes, ECM tool design, chemical machining, photochemical machining; Elastic emission machining; Advanced finishing processes, abrasive flow finishing, magnetic abrasive finishing, magneto rheological finishing, chemo-mechanical polishing; Comparative evaluation of different unconventional machining processes | (08 Hours) |
| UNIT-II | Computer Control of Manufacturing Processes Computers and CNC Architecture, Sensors and actuators, Logics and Programmable Logic Controllers, Discrete Control System Design, Motion Control Systems. Robotics and Robot Applications Definition and classification of ROBOTS and manipulators, motion and degrees of freedom, motion categories, uses, field of applications, Robot Arm Kinematics: Direct and Inverse, Robot arm dynamics, Manipulator trajectories, control of robot manipulators. Introduction to sensing and vision in robotics. | (08Hours) |

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| UNIT-III | Computer Integrated Manufacturing Evolution of Computer Integrated Manufacturing (CIM). Computer-Aided Design (CAD). Computer-Aided Manufacturing (CAM). CAD/CAM Integration. Review of automation and control technologies. Material Handling technologies. Data Communication technologies. Automatic Data Acquisition technologies. Database Management technologies. Various Manufacturing Systems: Group Technology & Cellular Manufacturing Systems, Flexible Manufacturing Systems, Transfer lines, Automated Assembly Systems. | (08 Hours) |
| UNIT-IV | Mechatronics and Manufacturing Automation Mechatronics in manufacturing, products and design. Review of fundamentals of electronics. Data conversion devices, sensors, micro sensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs. Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits. Pneumatic systems: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. | (08 Hours) |
| UNIT-V | Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology. | (08 Hours) |
| UNIT-VI | Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method. | (08 Hours) |

Text Books/References:

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|---|--|
| 1 | M. C. Shaw, Metal Cutting, Tata McGraw Hill, New Delhi, 2004. |
| 2 | M. C. Shaw, Principles of Abrasive Processing, Oxford University Press, 1996 |
| 3 | G. K. Lal, Introduction to Machining Science, New Age International Publishers, 2007. |
| 4 | G. Boothroyd and W. A. Knight, Fundamentals of Machining and Machine Tools, CRC-Taylor and Francis, 2006 |

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| 5 | K. S. Fu, R. C. Gonzalez and C.S.G. Lee, ROBOTICS: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987. |
| 6 | B. K. P. Horn, Robot Vision, MIT Press, Cambridge, 1986. |
| 7 | Y. Koren, Robotics for Engineers, McGraw Hill, 1985. |
| 8 | Groover, M. P., Automation production systems, and computer-integrated manufacturing, second edition, Prentice-Hall of India, New Delhi, 2001. |
| 9 | Vajpayee, S. K., Principles of computer-integrated manufacturing, Prentice-Hall of India, New Delhi, 2005. |
| 10 | Boucher, T. O., Computer automation in manufacturing: an Introduction, Chapman and Hall, 1996. |
| 11 | HMT Ltd. Mechatronics, Tata McGraw-Hill, New Delhi, 1988. |
| 12 | Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, 1994. |
| 13 | Boltan, W., Mechatronics: electronic control systems in mechanical and electrical engineering, Longman, Singapore, 1999. |
| 14 | Gary F. Benedict, Nontraditional Manufacturing Processes, Taylor & Francis, 1987. |
| 15 | P K Mishra, Non-Conventional Machining, Narosa India Publication, 1997. |
| 16 | Hassan El-Hofy, Advanced Machining Processes: Nontraditional and Hybrid Machining Processes, McGraw-Hill Prof Med/Tech, 2005. |
| 17 | P. C. Pandey and H. S. Shan, Modern Machining Processes, Tata McGraw-Hill Education, 1980. |
| 18 | James A. Brown, Modern Manufacturing Processes, Industrial Press, 1991. |
| 19 | J. A. McGeough, Micromachining of Engineering Materials, Taylor & Francis, 2001 |
| 20 | C. W. Ammen <i>The Complete Handbook of Sand Casting</i> . |

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY | | |
| FACULTY OF ENGINEERING AND TECHNOLOGY | | |
| Pre-Ph.D. Course-work Syllabus | | |
| Paper-III Specific Subject: Mechanical Engineering | | |
| Subject: Composite Material and Nanotechnology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |

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| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| UNIT - I | | |
| UNIT - II | <p>Basics of Nanoscience</p> <p>Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene's and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures - Fabrication, structure, electrical properties and mechanical properties</p> | (08 Hours) |
| UNIT - III | <p>Synthesis of Nonmaterial's</p> <p>Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation.</p> <p>Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method</p> | (08 Hours) |
| UNIT - IV | <p>Nanomaterials characterization</p> <p>Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy</p> | (08 Hours) |

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| UNIT - V | Planning of Experiments Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology. | (08 Hours) |
| UNIT - VI | Uncertainty in Measurements Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 | |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 | |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 | |
| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. | |
| 5 | S.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 | |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling | |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials | |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films | |
| 9 | Liu, Hand Book of Advanced Magnetic Materials (4 Vol.) | |

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| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka, Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced.

The following syllabus is prepared and approved by members.

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| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-IV Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview:</p> <p>This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy:</p> <p>Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE)</p> <p>Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: | |

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| | <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | <p>RPE 02: Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |
| UNIT - III | <p>RPE 03: Publication Ethics</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | <p>RPE 04: Open Access Publishing</p> <ol style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU | (08 Hours) |

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| | 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | |
| UNIT - V | <p>RPE 05: Publication Misconduct</p> <p>A. Group Discussions (2 hrs.)</p> <ol style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals:examples and fraud from India and abroad 4. Peer review proces <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund,cross check, plagscan, Crossref and other open source software tools.</p> | (08 Hours) |
| UNIT - VI | <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases <p>B. Research Metrics (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird,A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics.London. | |
| 3 | P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |

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| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. |
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |

Course Structure and Syllabus for PhD in Nanotechnology

Structure for Ph.D (Nanotechnology) Pre-Ph.D Course Work

2. Pre-Ph.d Course work will be having total 14 credits under four different heads.

| Sr. No. | Name of Course | Teaching Scheme (Hours/week) | | Examination Scheme (Marks) | | | | Credits | | |
|--------------|---|------------------------------|-----------|----------------------------|-----------|------------|------------|-----------|-----------|-----------|
| | | L | P | UE | IA | TW/OR | Total | L | P | Total |
| 1 | Research Methodology | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 2 | Programme Specific Course: Mechanical Engineering | 04 | - | 60 | 40 | - | 100 | 04 | - | 04 |
| 3 | Literature Survey and Presentation | - | 04 | - | - | 100 | 100 | - | 04 | 04 |
| 4 | Research and Publication Ethics | 04 | 02 | 30 | 20 | - | 50 | - | 02 | 02 |
| Total | | 12 | 06 | 120 | 80 | 150 | 350 | 08 | 06 | 14 |

Syllabus for PhD Nanotechnology

| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Ph.D. Course-work Syllabus | | |
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| Paper-I Research Methodology | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | End Semester Examination: 60 Marks Internal Assessment :40 Marks Total :100 Marks | Total Credits: 04 |
| Course Objectives: <ul style="list-style-type: none"> • begin to formulate researchable problem in areas of research interest; • write an effective research proposal or report; • make appropriate choices about research strategies; • review literature judiciously and systematically; • understand and begin to apply the principles of collecting research data; • understand and begin to conduct appropriate analyses of data; • make appropriate choices about quantitative methods; • demonstrate sensitivity to ethical issues raised by researchers; | | |
| Topics Covered | | |

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| UNIT-I | <p>Introduction Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Role of information and communication technology (ICT) in research, maintaining literature data using software tools, tabulation and graphical presentation of research data, use of statistical software tools in research.</p> <p>Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.</p> | (8 Hours) |
| UNIT-II | <p>Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives</p> <p>Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.</p> | (8 Hours) |
| UNIT-III | <p>Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.</p> | (8 Hours) |
| UNIT-IV | <p>Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)</p> | (8 Hours) |
| UNIT-V | <p>Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.</p> | (8 Hours) |
| UNIT-VI | Publishing of research work | (8 Hours) |

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| | <p>Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers.</p> <p>Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.</p> <p>Research Ethics: ethical issues in research, plagiarism tools and its importance.</p> <p>Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.</p> | |
| Assignments: | | |
| 23. | Identify and write the research gap areas based on the literature review. | |
| 24. | Use Mendeley or similar software and list the references in a report. | |
| 25. | Define a research problem and mention the scope and objectives of your research topic. | |
| 26. | Determine the limitations and assumptions of the identified research problem. | |
| 27. | Write a hypothesis for your identified research problem and apply the suitable method of hypothesis testing. | |
| 28. | Develop a research report based on your research area. | |
| 29. | Prepare effective power point presentation based on your research report. | |
| 30. | Present your research topic to the research committee. | |
| 31. | Design a review paper based on literature review carried out by you. | |
| 32. | Apply plagiarism tool and obtain the similarity index of your research report/manuscript. | |
| 33. | Learn any statistical tool such as R or SPSS and apply it to research data available in literature. | |
| Text Books/References: | | |
| 1. | Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004 | |
| 2. | Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011. | |
| 3. | C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004 | |
| 4. | S.D. Sharma, Operational Research, Kedar Nath Ram Nath & Co., 1972 | |
| 5. | B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014. | |
| 6. | Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005. | |
| 7. | T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi. | |
| 8. | A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009 | |
| 9. | R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992 | |

| <p style="text-align: center;">BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus</p> | | |
|---|--|--------------------------|
| <p style="text-align: center;">Paper-III Specific Subject: Nanotechnology Engineering Subject: Nanotechnology</p> | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Theory Examination: 100 Marks | Total credits: 04 |
| UNIT – I | <p>Basics of Nanoscience</p> <p>Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphene's and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties</p> | (06 Hours) |
| UNIT – II | <p>Synthesis of Nonmaterial's</p> <p>Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation.</p> <p>Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method</p> | (06 Hours) |

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|------------------------------------|--|-------------------|
| UNIT - III | <p>Nanomaterials characterization</p> <p>Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy</p> | (06 Hours) |
| UNIT - IV | <p>Sustainable Nanotechnology:</p> <p>Application of industrial ecology to nanotechnology, Fate of nanomaterials in environment, environmental life cycle of nano materials, environmental and health impacts of nano materials, toxicological threats, eco-toxicology, exposure to nano particles – biological damage, threat posed by nano materials to humans, environmental reconnaissance and surveillance. Corporate social responsibility for nanotechnology, Nano materials in future - implications.</p> | |
| UNIT - V | <p>Planning of Experiments</p> <p>Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2K factorial design. Taguchi method. Response surface methodology.</p> | (06 Hours) |
| UNIT - VI | <p>Uncertainty in Measurements</p> <p>Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.</p> | (06 Hours) |
| Text Books/Reference Books: | | |
| 1 | Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006 | |
| 2 | H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000 | |
| 3 | C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003 | |

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|----|---|
| 4 | C. Furetta, Hand book of thermoluminescence; World Scientific Publ. |
| 5 | 5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999 |
| 6 | C. Delerue, M.Lannoo; Nanostructures theory and Modelling |
| 7 | Fausto, Fiorillo, Measurement and Characterization of Magnetic materials |
| 8 | Janos H, Fendler; Nanoparticles and Nanostructured Films |
| 9 | Liu,Hand Book of Advanced Magnetic Materials (4 Vol.) |
| 10 | Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design |
| 11 | S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ. |
| 12 | Goser et al, "Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices" |
| 13 | A. A. Balandin and K. L. Wang, "Handbook of Semiconductor Nanostructures & Nanodevices" |
| 14 | Cao Guozhong, "Nanostructures & Nanomaterials -Synthesis, Properties & Application |

03. literature Survey and Presentation

Credits:04

Students are supposed prepare the report and give the presentation on based on literature review, research gap, proposed objective and methodology on the research topic.

04. New Course Research and Publications Ethics (RPE) is newly introduced.

The following syllabus is prepared and approved by members.

| | | |
|--|---------------------------------------|--------------------------|
| BHARATI VIDYAPEETH DEEMED UNIVERSITY FACULTY OF ENGINEERING AND TECHNOLOGY Pre-Ph.D. Course-work Syllabus | | |
| Paper-IV Subject: Research and Publications Ethics (RPE) Course for awareness about the publication ethics and publication misconducts. | | |
| <u>TEACHING SCHEME:</u> | <u>EXAMINATION SCHEME:</u> | <u>CREDITS ALLOTTED:</u> |
| Lectures: 4 Hours/Week | Total Marks 50: (20 IE+30 UE) | Total credits: 02 |
| <p>Overview:</p> <p>This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (Citation, h - index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.</p> <p>Pedagogy:</p> <p>Class room teaching, guest lectures, group discussions, and practical sessions.</p> <p>Evaluation: Total Marks 50: (20 TE+30 UE)</p> <p>Internal Continuous assessment of 20 marks will be done through 10 marks for publishing research paper and 10 marks for assignments, quizzes, group discussion and presentation. University Examination of 30 marks will be by final written examination. There will be 6 questions of 5 marks each with internal option available to all questions covering entire syllabus of the course.</p> | | |
| UNIT -I | RPE 01: Philosophy and Ethics: | |

| | | |
|-------------------|---|-------------------|
| | <ol style="list-style-type: none"> 1. Introduction to philosophy: Definition, nature and scope, concept, branches 2. Ethics: Definition, moral philosophy, nature of moral judgment and reactions. | |
| UNIT - II | <p>RPE 02: Scientific Conduct:</p> <ol style="list-style-type: none"> 1. Ethics with respect to science and research, Unethical Practices Nearly Identical to research misconduct 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), idea, data, method and text plagiarism 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data. | (08 Hours) |
| UNIT - III | <p>RPE 03: Publication Ethics</p> <ol style="list-style-type: none"> 1. Publication Ethics: Definition, introduction and importance, citations styles, objectivity, relevance, and transparency of the paper 2. Best Practices/ standards settings initiatives and guidelines: COPE, WAME, etc 3. Conflicts of interest with copyrights and patents 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Dominant laws regarding research ethics 7. Infringement 2pd enforcement of Copyright and Patents Practical | (08 Hours) |
| UNIT - IV | <p>RPE 04: Open Access Publishing</p> <ol style="list-style-type: none"> 1. Open Access Publications and Initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies 3. Software tool to identify predatory publications developed by SPPU | (08 Hours) |

| | | |
|------------------------------------|--|-------------------|
| | 4. Journal finder/ journal suggestions tools viz JANE, Elsevier Journal Finder, Spriger Journal Suggester, etc. | |
| UNIT - V | <p>RPE 05: Publication Misconduct</p> <p>A. Group Discussions (2 hrs.)</p> <ol style="list-style-type: none"> 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals:examples and fraud from India and abroad 4. Peer review proces <p>B. Software Tools (2 hrs.)</p> <p>Use of plagiarism software like Turnitin, Urkund,cross check, plagscan, Crossref and other open source software tools.</p> | (08 Hours) |
| UNIT - VI | <p>RPE 06: Database and Research Metrics:</p> <p>A. Databases (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Indexing databases 2. Citation Databases: Web of Science, Scopus, etc. 3. Open databases <p>B. Research Metrics (3.5 hrs.)</p> <ol style="list-style-type: none"> 1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h- index, g index, i 10 index, altmetrics. Web services: Mendeley, Zotero like platforms for citation and referencing. | (08 Hours) |
| Text Books/Reference Books: | | |
| 1 | Bird,A. (2006) Philosophy of Science. Routledge. | |
| 2 | MacIntyre, Alasdair (1967) A Short History of Ethics.London. | |
| 3 | P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865 | |

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|---|---|
| 4 | National Academy of Science. National Academy of Engineering and Institute of Medicine. (2009). On being a scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press. |
| 5 | Resnik,D.B. (2011). What is ethics in research and why it is important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.nieths.nih.gov/research/resources/bioethics/whatis/index.cfm |
| 6 | BeallJ. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. |
| 7 | https://doi.org/10.1038/489179a . |

Syllabus for Course work for
Ph. D. Environment Science and Technology
Faculty of Science

Effective from June 2017 onwards

Institute of Environment Education and Research
Bharati Vidyapeeth Deemed University, Pune

Bharati Vidyapeeth Deemed University
Faculty of Science

Title: Course work for Ph. D Environment Science and Technology

Nature of the Course- The course work will consist of three papers, the details of which are given below. All the three papers are compulsory. The duration of the course work will be of one semester.

| | | | |
|----|--|-----------|----------|
| 1. | Paper 1: Research Methodology and ICT for Research | 4 credits | 60 hours |
| 2. | Paper 2: Recent Advances in Environment Science and Technology | 4 credits | 60 hours |
| 3. | Paper 3: Literature Review | 2 credits | |

Assessment

1. The examination for each paper will be of 100 marks with three hours duration. Students have to attempt any five questions of the given choice of eight questions.
2. Paper 3 will be assessed based on two seminars – one in front of the internal research committee and the second in front of the examination committee.

Standard of passing

The candidate should secure minimum 50 marks in each paper including the seminar to get qualified to proceed further with the Ph. D. programme.

Attendance: 100% attendance is compulsory.

Paper I- Research Methodology and ICT for Research

| Unit | Topic | Hours |
|------|---|-------|
| 1. | <p>Basic concepts of Research</p> <p>Definition and basic concepts, objectives of research, Research approaches, types of research, techniques of research, hypothesisation, literature survey, selection of topic, compiling records.</p> | (08) |
| 2. | <p>Writing and Presentation Skills</p> <p>Different types of scientific documents, review paper, book reviews, research paper, thesis, project reports (for the scientific community and for funding agencies), and Conference report.</p> <p>Components of a research paper the IMRAD system, title, authors and addresses abstract, acknowledgements, references, tables and illustrations.</p> <p>Preparation for publications – submission of manuscript, ordering reprints.</p> <p>Presentation of research: Oral and poster presentation, presentation in conferences and symposia.</p> <p>Preparation and submission of research proposals to the funding agencies.</p> | (14) |
| 3. | <p>Plagiarism</p> <p>Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work.</p> | (04) |
| 4. | <p>Statistics</p> <p>Definition, population and sample, sampling techniques and types of samples, statistics and parameters.</p> <p>Summarization of data and estimation.</p> <p>Measures of central tendency – Mean, Mode, Median</p> <p>Measures of dispersion – Variance and standard deviation.</p> <p>Estimation: Confidence interval</p> <p>Graphical representation and histograms.</p> <p>Hypothesis testing: Significance testing, student's test Chi square test.</p> | (10) |

| | | |
|-----------|--|-------------|
| | Analysis: ANOVA, Regression and correlation analysis. | |
| 5. | <p>Informatics</p> <p>Basics of Internet and Informatics: Telnet, FTP, e-mail, world wide web (WWW), navigating the www, search engines.</p> <p>Databases – definition, some examples of databases, database management systems.</p> <p>Use of databases:</p> <p>Concepts, methods and calculations.</p> <p>Information retrieval from databases.</p> <p>Analysis and prediction.</p> | (10) |
| 6. | <p>Patenting and Intellectual Property</p> <p>Introduction, patent laws, composition of patents, applying and obtaining patent, problems encountered.</p> | (04) |

BOOKS RECOMMENDED

1. Bailey N.T.J. (1995) Statistical Methods in biology 3rd Edition. Cambridge low price Edition Cambridge university press.
2. Baxevanis A. D. and B. F. F. Ouellette, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins.
3. Bergeron B. (2003). Bioinformatics and Computing. Prentice Hall Inc. Eastern Economy Edition.
4. Bergey's Manual of Systematic bacteriology (2nd Ed.), Volume, 1 Springer.
5. Campbell R. C. : Statistics for Biologist, Cambridge University Press.
6. Day Robert A. : How to write and publish a scientific paper.
7. Dixit J. V. (1996) Principles and Practice of Biostatistics 1st Edn. M/s. Banarasidas Bhanot (Publisher).
8. Dixit M. (1999) Internet: an Introduction, Tata Mc Graw Hills Series.
9. Dwyer. R. A. (2003) Genomic Perl. From Bioinformatics: Basics to working code. Cambridge University Press.
10. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier.
11. Gibaldi Joseph: MLA handbook for Writers of Research Papers.
12. Irwin H. Segel (1976) biochemical Calculations 2nd Edition John Wiley and Sons.
13. Khan and Khanum, (2008) Fundamentals of Biostatics, 3rd Revised Edition, Ukaaz Publication, Hyderabad.
14. Khan Imtiaz Alam: Elementary Bioinformatics, Pharma Book Syndicate.
15. Kothari R. C. Research Methodology, Methods and Techniques, 2nd revised edition, New Age International.
16. Prescott. S. C. and C. G. Dunn (2002) Industrial Microbiology. Publ. Agrobios. India Jodhpur
17. Ranjit Kumar: Research Methodology.
18. Reed, R. Homes, D; Weyers, J. and A. Jones. Practical skills in Bimolecular Sciences. Addison Wesley Longman Limited.
19. Simpson R. J. (2004) Purifying Proteins for Proteomics. A laboratory Manual. Cold spring Harbor laboratory press.
20. Sneath, P. H. A. Mair: N. S. Sharpe : M. E. and J. G. Holt (EDs) (1986), Bergey's Manual of Systematic bacteriology Vol. II Williams and Wilkins, Baltimore, London, Tokyo.
21. T. Bhaskararao (2002) Methods of Biostatistics. Paras Publishing.
22. Wardlaw A. C. (1985) Practical statistics for experimental Biologists John Wiley and Sons. Ltd.
23. Wayne Daniel: Biostatistics – A Foundation for Analysis of Health Sciences, John Wiley and Sons, Inc.
24. Wayne Goddard and Stuart Melville: Research methodology – An Introduction.
25. Westhead. D. R. Parish J. H. and R. M. Twyman (2003) Instant notes in 'Bioinformatics' Viva Books Private Ltd.

Paper 2- Recent Advances in Environment Science and Technology

| Unit | Topics | Hours |
|------|---|-------|
| 1 | <p>Biological Assessment Techniques</p> <ul style="list-style-type: none"> • Sampling techniques for vegetation using quadrat and transect (use of software) • Animal Census Technique- direct and indirect methods (use of software) • Animal Acoustic studies (use of software) • Ecosystem evaluation techniques • Genetic Studies | (15) |
| 2 | <p>Qualitative Assessment Techniques</p> <ul style="list-style-type: none"> • Content Analysis Technique • Questionnaire Survey • Descriptive data analysis technique (ATLAS) • PRA Techniques • Environmental Education Techniques | (5) |
| 3 | <p>Mapping Techniques</p> <p>Annotation of SOI topographical maps (with reference to numbering, scales, grid reference, signs and symbols, colour system)</p> <p>Interpretation of SOI maps</p> <p>Fundamentals of Geographic Information Systems (building spatial and non spatial databases, map making)</p> <p>Use of geospatial modelling</p> <p>Use of satellite navigation systems to collect data</p> | (15) |
| 4 | <p>Environment Quality Assessment Techniques</p> <p>A. Examination of water and wastewater</p> <ul style="list-style-type: none"> • Physical parameters: Temperature, Colour, Taste, Odour, Turbidity • solids (TSS < TDS) • Chemical parameters: pH, Conductivity, Hardness, Acidity and Alkalinity, DO, BOD, COD, Chlorides, Fluorides, Sulphates, Phosphates, Nitrates, Calcium, Magnesium, Sodium, Potassium, | (20) |

| | | |
|----------|---|------------|
| | <p>Pesticides, Oil and Grease, Sulphide, Phenolic compounds, Heavy metals</p> <ul style="list-style-type: none"> • Biological and Microbiological parameters: MPN, Total coliforms, Faecal coliforms, Isolation of microorganism | |
| | <p>B. Air and Noise Quality assessment methods</p> <ul style="list-style-type: none"> • Meteorological parameter monitoring: Wind speed , Wind direction, Temperature, Relative humidity, Rainfall, Wind rose diagram • Pollutant Estimation: Suspended Particulate Matter, Respirable Particulate Matter, Sulphur Dioxide , Oxides of Nitrogen, Hydrogen Sulphide, Ammonia , Hydrocarbons, Volatile Organic Carbons, Odour • Measuring noise levels, Leq | |
| | <p>C. Soil Quality Assessment Methods</p> <p>Particle size distribution , texture, pH, Electrical conductivity, cation exchange capacity, alkali metals, Sodium absorption ratio, Porosity and permeability</p> | |
| | <p>D. Solid waste assessment methods</p> <p>Per capita generation of solid waste , general segregation into biological/organic/inert/hazardous, loss on heating, pH, Electrical Conductivity , Calorific value ,Metals etc</p> | |
| 5 | <p>Environment Management Techniques</p> <p>Calculating ecological footprint for a given area</p> <p>Impact analysis using various methods</p> <p>Life cycle assessment</p> <p>Design of wastewater treatment plant : System kinetics for wastewater treatment- chemical/ physical and biological, Environmental Systems Optimization Techniques</p> | (5) |
| | | 60 |

BOOKS RECOMMENDED

1. Groom M.J., Meffe G.K. and Carroll C.R. (2006) *Principles of Conservation Biology* (3rd edition), Sinauer Associates, Sunderland
2. Gopal, R., 2011. *Fundamentals of Wildlife Management*. Natraj Publishers, New Delhi.
3. Sawarkar, V.B., 2005. *A guide to planning wildlife management in protected areas & managed landscapes*. Natraj Publishers.
4. Primack R.B. (2006) *Essentials of Conservation Biology* (4th ed.), Sinauer Associates, Sunderland.
5. Yadav L., Singh J., Srivastava J., *Advanced practical's of chemistry* (2014) Pragati Prakashan
6. Atkins, P., 2010. *Shriver and Atkins' inorganic chemistry*. Oxford University Press. (free pdf available at <http://ondobook.com/dl/shriver-and-atkins-inorganic-chemistry-5th-edition-free-download.pdf>)
7. Lo. C. P., A.W. Yeung, *Concepts and Techniques of Geographical Information Systems*, Prentice- Hall of India Pr. Ltd., 2002.
8. Kang-stung-Chang, *Introduction to Geographical Information System*, Tata McGraw Hill Pub. Comp, 2002.
9. El-Rabbany, A., 2002. *Introduction to GPS: the global positioning system*. Artech House.
10. Arthur Robinson, H., 1958. *Elements of cartography*, John Wiley and Sons Inc.

BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY, PUNE

Ph. D in Nursing

Pre- PhD Course Syllabus: 2018-19

| | | |
|----------------------------|---|-------------------|
| Subject | : | Trends in Nursing |
| Total Hours of Instruction | : | 60 |
| Course code | : | PHDN01 |
| Total credits | : | 08 |
| Lecture | : | 03 credits |
| Assignments | : | 03 credits |
| Written examination | : | 02 credits |

Introduction:

The course is designed to enable the student to review all the theories, its applications, philosophy of nursing science and current trends & issues in nursing.

Course objectives:

At the end of the course students will be able to:

- Learn the development of theories
- Apply nursing theories into practice
- Practice evidence based nursing
- Practice trans-cultural nursing
- Apply knowledge of geriatric nursing into practice
- Gain knowledge regarding independent midwifery practice
- Develop clinical pathways in nursing
- Utilize reflective thinking in nursing
- Practice problem based nursing
- Identifies strategies to maintain professional ethics
- Communicate effectively
- Know the standards of nursing practice
- Apply knowledge of informatics and technology in nursing practice
- Identify career opportunities in nursing
- Identify professional nursing implications for future nursing
- Know the areas of nursing.

Faculty in course:

Dr. Sneha A Pitre

Course coordinator,
Principal & Dean
BVDU College of
Nursing
Katraj, Dhankawadi
Pune-411043
Mob: +91-9970709068
Email:
pitresneha@gmail.com

Dr. Nilima Bhore

Principal
BVDU College of
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Mob: +91-9421116317
Email:
nilimabhore@yahoo.co
.in

Dr. Suresh Ray

Associate Professor
BVDU College of Nursing
Katraj, Dhankawadi
Pune-411043
Mob: +91-9823954332
Email:
raysureshkumar@gmail.com

Basic information:

- a) Student centre

The student centre at Bharati Vidyapeeth University College of Nursing, Pune & Sangli will assist with academic matters such as: general information about the courses, schedules, registration, examination and certificates. The student will also be assisted and supported in other matters during your course of study by the division of student affairs. See more information at

www.bharativedyapeeth.edu or <http://bvuniversity.edu.in/Programmes/FacultyOfNursing.aspx>

Contact details:

BVDU college of Nursing

Dhankawadi, Katraj

Pune-411043

Phone: 020-24372496

Email: bvduphd@gmail.com

BVDU college of Nursing,

Sangli- Miraj Road,

Wanlesswadi, Sangli

Teaching- Learning Methods

Teaching includes lectures, seminars, journal presentations, written assignments, individual and group discussions. The course language and literature is in English. The purpose of the different teaching method is to give you the opportunity to extend your knowledge through literature, research articles, cooperation, discussion, debating and critical reflection both individually and in groups. The underlying idea is to make you reflect on nursing theories, nursing pathways, reflective thinking, and clinical practice guidelines etc.

a) Seminars

Seminar is an important educational method at university. A seminar is an activity which stimulates continuing intellectual curiosity and demands that you come well prepared by reading recommended texts in advance.

b) Responsibility of the course coordinator

Course coordinators and faculty will provide the pre-requisites to fulfill the goals of the course. They plan and arrange lectures, written assignments, journal presentations and seminars in order to stimulate your learning, give suggestions about literature, organize and make communication tools and material available. The course coordinators will also give you opportunity to evaluate the course.

c) Responsibility of the student

As a student you will prepare for every scheduled course date by reading suggested literature and carry out designated individual assignments, group work and research studies. As a student you are individually responsible for taking part of the information that is given to you by the faculty. It is also your responsibility to help evaluate the course after it is finished.

All scheduled course dates are compulsory and if you are not able to attend for any valid reason, the course coordinator should be informed via phone or e-mail. All assignments are to be turned in on time and exams taken when scheduled. If you are not able to complete an assignment on time, you must request in advance of the due date and extension from the course coordinator.

d) Plagiarism

The following things are counted as plagiarism:

- Copying other people's texts verbatim without using quotes and complete reference with page numbers.
- Citing the work of others by merely changing a few words or sentences of the original text.

Any cases of suspected cheating is handled by the disciplinary board at Bharati Vidyapeeth University

Examination

The course content covers 8 credits during 6 months/24 weeks. The examination of this course divided in four parts:

- a) **Journal presentation (1 credit):** prepare article on the given topic. Write down your reflection on the encounters. Relate and refer to the theories you have studied in literature so that you will be able to discuss this with teachers and fellow students.
- b) **Written assignment(1 credit):** written report on the given topic
- c) **Seminars (1 credit):** presentation of the study assignments. The presentation can be in the form of poster, power point presentation, role play or any other illustrative way.
- d) **Written examination (2 credits):** individual written examination based on learning objectives.

The final course grade of 8 points on the course Trends in Nursing is based on an overall assessment of the above four parts. To receive a pass on the full course 4 credits are required.

Course evaluation

We find it of great importance that you both orally and in writing will share your opinions and suggestions to help us improve the course. The course evaluation is done online in the final week of the course.

- 1) Course module:

To help you to reach the course and learning objectives, the course has been divided as follows:

| Unit No | Unit content | Periods (Lecture) | Self study/assignment hours | Credit | Duration of exam | Assessment method | Evaluation Scheme | | Total |
|---------|---|-------------------|-----------------------------|---------------------------------------|------------------------|------------------------|-------------------|----------|-------|
| | | | | | | | Internal | External | |
| I. | Epistemology | 3 | 1 | Seminar- 1 (1credit) | 3 hours (2 credits) | Written assignment - 1 | 25 | 75 | 100 |
| II. | Overview of theories in nursing | 6 | | | | | | | |
| III. | Application of theories into nursing practice | 6 | 1 | 1 | | | | | |
| IV. | Evidence based nursing | 2 | 1 | | | | | | |
| V. | Trans-cultural nursing | 2 | 1 | Journal presentation – 1 (1credit) | | | | | |
| VI. | Geriatric nursing | 2 | 2 | | | | | | |
| VII. | Independent midwifery practitioner | 2 | 1 | | | | | | |
| VIII. | Nursing pathways/ critical | 2 | 2 | | | | 1 | | |

| Unit | Unit content | Periods | Self | Credit | Duration of | Assess | Evaluation Scheme | | Total |
|-------|---|---------|------|-----------------------------------|-------------|--------|-------------------|--|-------|
| | thinking | | | | | | | | |
| IX. | Reflective thinking in learning | 2 | 1 | | | | | | |
| X. | Problem based learning | 2 | 1 | | | | | | |
| XI. | Morality and ethics in nursing practice | 2 | | Written assignment - 1 (1 credit) | | | | | |
| XII. | Professional communication | 2 | 1 | | | | | | |
| XIII. | Clinical practice guidelines | 2 | | | | | | | |
| XIV. | Standards of nursing practice and quality assurance | 2 | 1 | | | | | | |
| XV. | Informatics | 2 | 1 | | 1 | | | | |

| Unit | Unit content | Periods | Self | Credit | Duration of | Assess | Evaluation Scheme | | Total |
|-------|---------------------------------|---------|------|--------|-------------|--------|-------------------|--|-------|
| | and technology in nursing | | | | | | | | |
| xvi. | Career opportunities in nursing | 2 | 1 | | | | | | |
| xvii. | Future of nursing | 2 | | | | | | | |
| Xviii | Areas of nursing research | 2 | | | | | | | |

- Key:

L= lecture

1L=1 hr

1 credit (1C) = 10 hours of lecture

Course literature and research article relevant to the course:

Course schedule:

| Week | Time & frequency | Venue | Contents & assignments |
|------------------------|--|---|---|
| 1. 2. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune-43 | <ul style="list-style-type: none"> ● Epistemology ● Overview of theories in nursing |
| 3. 4. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune-43 | <ul style="list-style-type: none"> ● Application of theories into nursing practice ● Evidence based nursing |
| 5. 6. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune-43 | <ul style="list-style-type: none"> ● Trans-cultural nursing ● Geriatric nursing ● Independent midwifery practitioner |
| 7. 8. | 9:00 am to 4:00 | Authentication | <ul style="list-style-type: none"> ● Seminar -- 1 |

| | | | |
|------------|---|---|---|
| | pm (6 hours) ONCE | hall BVDU college of Nursing, Pune- 43 | |
| 9. 10. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune- 43 | <ul style="list-style-type: none"> • Nursing pathways/ critical thinking • Reflective thinking in learning • Problem based learning |
| 11. 12. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune- 43 | <ul style="list-style-type: none"> • Morality and ethics in nursing practice • Professional communication Clinical practice guidelines • Standards of nursing practice and quality assurance |
| 13. 14. | 9:00 am to 4:00 pm (6 hours) ONCE | Authentication hall BVDU college of Nursing, Pune- 43 | Journal presentation - 1 |
| 15. | 9:00 am to 4:00 | Authentication | Informatics and technology in |

| | | | |
|-----|---------------------------------|---|--|
| 16. | pm (6 hours) ONCE | hall BVDU college of Nursing, Pune- 43 | nursing Career opportunities in nursing |
| 17. | 9:00 am to 4:00 pm (6 hours) | Authentication hall | Written assignment--1 |
| 18. | ONCE | BVDU college of Nursing, Pune- 43 | |
| 19. | 9:00 am to 4:00 pm (6 hours) | Authentication hall | Future of nursing Areas of nursing research |
| 20. | ONCE | BVDU college of Nursing, Pune- 43 | |
| 21. | Study leave | Study in place of own choice | Written examination |
| 22. | | | |
| 23. | Study leave | Study in place of own choice | |
| 24. | | | |

Nilima
Dr. (Mrs.) Nilima Rajan Bhore
 Dean, Faculty of Nsg. / Principal
 BVDU, College of Nsg. Sangli.



Bharati Vidyapeeth Deemed to be University
Faculty of Nursing
Pre- PhD Course schedule: 2018-19 (Nursing: 60hrs)

| Unit No | Unit content | Periods (Lecture) | Self study/ assignment hours | Date | Day | Under supervision of | Signature |
|---------|---|-------------------|------------------------------|-------------------|---------------|-----------------------|-----------|
| | Introduction | 2 | 1 | 16/11/2018 | Friday | Dr. Suresh Ray | |
| 1. | Epistemology | 2 | 1 | 23/11/2018 | Friday | Dr. Anita Nawale | |
| 2. | Overview of theories in nursing | 2 | 1 | 07/12/2018 | Friday | Dr. Jyotsna D | |
| 3. | Application of theories into nursing practice | 2 | 2 | 14/12/2018 | Friday | Dr. Veena S | |
| 4. | Evidence based nursing | 2 | 1 | 30/11/2018 | Friday | Dr. Lily Podder | |
| 5. | Trans-cultural nursing | 2 | 1 | 21/12/2018 | Friday | Dr. Jyotsna D | |
| 6. | Geriatric nursing | 2 | 1 | 04/01/2019 | Friday | Dr. Anita Nawale | |
| 7. | Independent midwifery practitioner | 2 | 1 | 11/01/2019 | Friday | Dr. Nilima Bhole | |
| 8. | Nursing pathways/ critical thinking | 2 | 2 | 18/01/2019 | Friday | Dr. Khurshid Jamadar | |
| 9. | Reflective thinking in learning | 2 | 2 | 25/01/2019 | Friday | Dr. Sundari Apte | |
| 10. | Problem based learning | 2 | 1 | 11/01/2019 | Friday | Dr. Aparna Kale | |
| 11. | Morality and ethics in nursing practice | 2 | 2 | 01/02/2019 | Friday | Dr. Suresh Ray | |
| 12. | Professional communication | 2 | 1 | 15/02/2019 | Friday | Dr. Lily Podder | |
| 13. | Clinical practice guidelines | 2 | 2 | 08/02/2019 | Friday | Dr. Veena S | |
| 14. | Standards of nursing practice and quality assurance | 2 | 1 | 22/02/2019 | Friday | Dr. Bhagyshree J | |
| 15. | Informatics and technology in nursing | 2 | 2 | 01/03/2018 | Friday | Dr. Anita Nawale | |
| 16. | Career opportunities in nursing | 2 | 1 | 08/03/2018 | Friday | Dr. Supriya Pottal | |
| 17. | Future of nursing | 2 | 1 | 15/03/2018 | Friday | Dr. Khurshid Jamadar | |
| 18. | Areas of nursing research | 2 | 1 | 28/12/2018 | Friday | Dr. Sujita Devi | |
| | Total | 38 | 26 | | | | |

Bharati Vidyapeeth Deemed to be University

Faculty of Nursing

Pre- PhD Course schedule: 2018-19 (Research Methodology: 60hrs)

| Unit No | Unit content | Periods (Lecture) | Self study/ assignment hours | Date | Day | Under supervision of | Signature |
|---------|--|-------------------|------------------------------|------------|--------|---------------------------------------|-----------|
| 1. | Orientation to the course | 2 | 1 | 16/11/2018 | Friday | Dr. Suresh Ray | |
| 2. | Chapter-1: Introduction | 2 | 4 | 23/11/2018 | Friday | Dr. Anita Nawale | |
| 3. | Chapter-2: Review of Literature | 2 | 3 | 07/12/2018 | Friday | Dr. Supriya Pottal | |
| 4. | Chapter-3: Research Approach And Design | 4 | 6 | 30/11/2018 | Friday | Dr. Lily Podder | |
| 5. | Chapter-4: Research Problem | 2 | 3 | 14/12/2018 | Friday | Dr. Sujita Devi | |
| 6. | Chapter-5: Developing theoretical and Conceptual Framework | 2 | 2 | 11/1/2019 | Friday | Dr. Nilima Bhore & Dr. Aparna Kale | |
| 7. | Chapter-6: Sampling | 2 | 3 | 21/12/2018 | Friday | Dr. Suresh Ray | |
| 8. | Chapter-7: Tool and Methods of Data Collection | 4 | 6 | 18/01/2019 | Friday | Dr. Veena S | |
| 9. | Chapter-8: Analysis and interpretation of Data | 4 | 6 | 25/01/2019 | Friday | Dr. Sundari Apte | |
| 10. | Reporting and utilizing research findings | 2 | 3 | 25/01/2019 | Friday | Dr. Jyotsna D & Dr. Bhagyshree Jogdeo | |
| 11. | Dissemination & Publication of research findings | 2 | 3 | 01/02/2018 | Friday | Dr. Khurshid Jamadar | |
| | Total | 28 | 40 | | | | |

Bharati Vidyapeeth Deemed to be University
Faculty of Nursing
Pre- PhD Course schedule: 2018-19 (Nursing: 60hrs)
Assignments Distribution


| S.No. | Name of the Ph.D. Scholar | Topic for the Seminar/Journal Presentation/Written Assignment | Maximum Marks | Date of the Presentation/ Submission | Under the Guidance of | Signature |
|-------|---------------------------|---|---------------|--------------------------------------|-----------------------|-----------|
| 1. | Mr. Basvanth | Seminar | | | | |
| | | Informatics & Technology in Nursing | 25 | 02.03.2018 | Dr. Anita Nawale | |
| | | Future of Nursing | 25 | 16.03.2018 | Dr. Khurshid Jamadar | |
| | | Journal Presentation | | | | |
| | | Transcultural Nursing | 25 | 21.12.2018 | Dr. Jyotsna D | |
| | | Written Assignment | | | | |
| | | Nursing Process with theory application-1 | 25 | 04.01.2019 | Dr. Suresh Ray | |
| | | | 100 | | | |
| 2 | Mr. Zeeshan | Seminar | | | | |
| | | Geriatric Nursing | 25 | 05.01.2019 | Dr. Anita Nawale | |
| | | Standard of Nursing Practice & Quality Assurance | 25 | 23.02.2018 | Dr. Bhagyshree J | |
| | | Journal Presentation | | | | |
| | | Reflective Thinking in Learning | 25 | 25.01.2019 | Dr. Sundari Apte | |
| | | Written Assignment | | | | |
| | | Nursing Process with theory application-1 | 25 | 04.01.2019 | Dr. Suresh Ray | |
| | | | 100 | | | |

Bharati Vidyapeeth Deemed to be University
Faculty of Nursing
Pre- PhD Course schedule: 2018-19 (Nursing: 60hrs)
Assignments Distribution

| S.No. | Name of the Ph.D. Scholar | Topic for the Seminar/Journal Presentation/Written Assignment | Maximum Marks | Date of the Presentation/ Submission | Under the Guidance of | Signature |
|-------|---------------------------|---|---------------|--------------------------------------|-----------------------|-----------|
| 3. | Ms. Manu A Roy | Seminar | | | | |
| | | Problem Based Learning | 25 | 11.01.2019 | Dr. Aparna Kale | |
| | | Professional Communication | 25 | 16.02.2019 | Dr. Lily Podder | |
| | | Journal Presentation | | | | |
| | | Critical Thinking | 25 | 18.01.2019 | Dr. Khurshid Jamadar | |
| | | Written Assignment | | | | |
| | | Nursing Process with theory application-1 | 25 | 04.01.2019 | Dr. Veena S | |
| | | | 100 | | | |
| 4 | Ms. Merlin | Seminar | | | | |
| | | Carrier opportunities in Nursing | 25 | 09.03.2018 | Dr. Supriya Pottal | |
| | | Areas of Nursing Research | 25 | 29.12.2018 | Dr. Sujita Devi | |
| | | Journal Presentation | | | | |
| | | Midwife Practitioners | 25 | 11.01.2019 | Dr. Nilima Bhore | |
| | | Written Assignment | | | | |
| | | Nursing Process with theory application-1 | 25 | 04.01.2019 | Dr. Veena S | |
| | | | 100 | | | |

Bharati Vidyapeeth Deemed to be University
Faculty of Nursing
Pre- PhD Course schedule: 2018-19 (Research Methodology: 60hrs)
Assignments

| S.No. | Name of the assignments | M.M. |
|--------------|---|-------------|
| 1. | Thrust areas of Research in your speciality | 10 |
| 2. | 10 Research Problem statements | 10 |
| 3. | How to write Review of an article and reference | 10 |
| 4. | Note on Plagiarism | 10 |
| 5. | Determination of Sample Size | 10 |
| 6. | Preparation of a data Collection Tool | 10 |
| 7. | Abstract writing for Publication | 10 |
| 8. | Note on Citations, Impact Factor and h-Index | 10 |
| 9. | Research Funding agencies In India | 10 |
| 10. | Research article Presentation | 10 |
| | Total | 100 |


Dr. (Mrs.) Nilima Rajan Bhore
Dean, Faculty of Nsg. / Principal
BVDU, College of Nsg. Sangli.



BHARATI VIDYAPEETH
Deemed to be University

AYURVED
**[Pre Ph. D.-Six month course work
structure]**

Faculty of Ayurved

BHARATI VIDYAPEETH Deemed to be University
Pune-411030

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1.2 Quantitative methods -**15 hours- 30 marks.**

| SR. NO. | TOPIC | hours |
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| 1. | APPLICATION OF MEDICAL STAISTICS IN AYURVED. a. Data collection. b. Compilation & tabulation. c. Methods of data collection. d. Measures of central tendency. e. Measures of variability. | 5 |
| 2. | a. Probability concept. b. Normal distribution & properties. c. Regression analysis & interpretation. | 5 |
| 3. | a. Design of experiment (ANOVA, ANCOVA etc.) b. Non-parametric tests. | 5 |

1.3 Computer applications-**10 hours- 20 marks.**

| Sr. No. | TOPIC | hours |
|----------------|---|--------------|
| 1. | Information technology | 2 |
| 2. | Internet and web | |
| 3. | The system unit | 2 |
| 4. | Software- A) System softwares B) Application softwares- a. basic application softwares b. specialized application softwares | 4 |
| 5. | Communication and networks | 2 |

Paper II

A Specialized Subject

2.1 Ayurved Samhita and Siddhant

Marks- 100

Credit- 4 Credits - Hours – 60 hours [each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|--|----------|
| 1. | <ul style="list-style-type: none"> • Charak Samhita Sutrasthan & CharakSamhita Chikitsasthan with ChakrapaniCommentary . • Importance of CharakSamhita in present era for maintenance of health & treatment of diseases. • AnuktaVyadhiChikitsa Siddhant from Charak Samhita. | 15 hours |
| 2 | <ul style="list-style-type: none"> • Special features of “Chikitsa” from SushrutSamhita. • NidanaSthan from SushrutSamhita with Dalhan and Gayadas commentaries. • Special features of SutraSthan ofSushrutSamhita with Dalhan and Chakrapani commentaries. | 15 hours |
| 3 | <ul style="list-style-type: none"> • Dietary principles from Ashtang Hridaya & Ashtang Sangrah. • Life Style disorders. • Rasayan &Vajikarana Chikitsa from Bruhatrayee. • Peer reviewed journals in Ayurved. | 15 hours |
| 4 | <ul style="list-style-type: none"> • Fundamental principles related to Mind. • Role of Mind in health maintenance in current era • Update researches on Dosha Dhatu Mala . • Manuscriptology | 15 hours |

2.2 Kriya Sharir

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No | Topic | Hrs | Total hrs |
|--------|--|-----|-----------|
| 1. | <u>Study of Basic principles related to Kriya Sharir</u> | | 15 |
| | Panchabhautic Siddhant Lokpurush SiddhantSamanya Vishesh SiddhantTrigun Tridosha Siddhant | 4 | |
| | Applied aspect of Prakruti. Study of Deha and Manas Prakruti their classification and features of different Prakruti | 3 | |
| | Applied aspect of Sarata | 3 | |
| | Ayurvedic concept of Manas Atma and Indriya- (Description of Manas properties its location, objects functions and qualities Mechanism of Dyanotpatti) | 2 | |
| | Physiology of sleep and dreams, physiology of cognitive processes | 2 | |
| | Description of concept of Atma and its features | 1 | |
| 2 | <u>Applied aspect of Dosha Dhatu Mala</u> | | 15 |
| | Physiological study of Human body as a composite of Dosha, Dhatu and Mala. | 3 | |
| | Properties, qualities, functions, locations and types of Dosha Dhatu and Mala, their Panchabhautika | 3 | |
| | composition Causes and features of Vriddhi and Kshaya of DoshaDhatu and Malas. | 3 | |
| | Description of Ojas. | 1 | |
| | Define Immunity. Types of immunity | 1 | |
| | Mechanisms of formation of urine, feces and sweat; | 2 | |

| | | | |
|---|--|---|----|
| | their functions according to Ayurveda and modern science. Physiology, Histology and functional anatomy of Excretory system. | | |
| | Modern laboratory and Ayurvedic and clinical methods to assess the functioning of Dosha, Dhatu, Mala and other factors | 2 | |
| 3 | <u>Ayurvedic and modern concept of Digestion</u> | | 15 |
| | Study of Ahar and its allied aspect | 2 | |
| | Study of Agni .Functions of Jatharagni, Bhutagni and Dhatvagni in detail. | 3 | |
| | Detailed study of Ahar Awasthapak ,Vipak, | 2 | |
| | Phenomenon of Koshtha. | 1 | |
| | Physiology Histology and functional anatomy of Digestive System. | 2 | |
| | Study of Liver Spleen Pancreas. | 2 | |
| | Basic biochemistry of digestion, absorption, and metabolism of fats, proteins, carbohydrates, vitamins, minerals and water. | 3 | |
| 4 | <u>Ayurvedic and Modern Physiology of Body Systems</u> | | 15 |
| | Physiology Histology and functional anatomy of Cardiovascular system | 2 | |
| | Physiology Histology and functional anatomy of Respiratory system | 2 | |
| | Physiology Histology and functional anatomy of Reproductive system. | 2 | |
| | Ayurvedic and modern views on physiology of nervous system including physiology of special senses | 2 | |
| | Physiological study of Endocrinology. | 2 | |
| | Instruments related to Kriya Sharir | 2 | |
| | Modern methods for quantitative assessment of various body components; Development of possible objective parameters.Techniques and principles of associated instruments. | 2 | |
| | Description of recent advances in the understanding of different biophysical and Biochemical mechanisms involved in physiology and their correlation with Ayurvedic Fundamentals | 1 | |

2.3 Rachana Sharir

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No/ Sections | Details of Topics | Hours of Teaching Learning/Credit |
|---------------------|--|--|
| 1. | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sutrasthan</p> <ol style="list-style-type: none">1. Adhyaya 1. :- Vedotpatti2. Adhyaya 2.:- Shishyopnayaniya3. Adhyaya 3.:- Adhyayansampradaniya4. Adhyaya 4.:- Prabhashaniya5. Adhyaya 5.:- Agroupaharniya6. Adhyaya 14.:- Shonitvarniya <p>Sushrut Samhita Sharirsthan</p> <ol style="list-style-type: none">7. Adhyaya 1.:- Sarvabhutachintasharir | <p style="text-align: center;">15</p> <p style="text-align: center;">.....</p> <p style="text-align: center;">1 Credit</p> |
| 2. | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sutrasthan</p> <ol style="list-style-type: none">1. Adhyaya 15.:- Doshdhatumalakshyavruddhividnyaniya2. Adhyaya 20.:- Hitahita3. Adhyaya 21.:- Vranaprashna <p>Sushrut Samhita Sharirsthan</p> | |

| | | |
|---|---|--|
| | <p>4. Adhyaya 2. :- Sukrashonitsuddhisharir</p> <p>5. Adhyaya 3.:- Garbhaavakrantisharir</p> <p>6. Adhyaya 4.:- Garbhavyakaransharir</p> <p>7. Adhyaya 5.:- Sharirsamkyavyakaransharir</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |
| 3 | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Nidsanstan</p> <p>1. Adhyaya 1.:- Vatavyadhinidan</p> <p>2. Adhyaya 15.:- Bhagnanidan</p> <p>Sushrut Samhita Sharirsthan</p> <p>3. Adhyaya 7.:- Siravarnavibhaktisharir</p> <p>4. Adhyaya 8.:- Siravyadhvidhishsarir</p> <p>5. Adhyaya 9.:- Dhamanivyakaransharir (Basic principles of Sira Dhamani and Srotassharir)</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |
| 4 | <p>Study of following adhyaya with its applied aspects:</p> <p>Sushrut Samhita Sharirsthan</p> <p>1. Adhyaya 6.:- Pratekmarmanirdeshsarir</p> <p>2. Adhyaya 10.:- Garbhinivyakaransharir</p> | <p>15</p> <p>.....</p> <p>1 Credit</p> |

2.4 Agad Tantra, Vyavahar Ayurved evam Vidhi Vaidyak

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|--|-------|
| 1. | <ul style="list-style-type: none">• Definition & properties of <i>Visha</i>, <i>Visha samprapti</i>, <i>Vishaprabhava</i>, <i>Vishavega</i>, <i>vegantara</i> and <i>Vishakarmukata</i>, <i>Shankavisha</i> & <i>Vishasankat</i> (toxicodynamic and toxicokinetic study).• Garavisha and Dushi visha, their varieties, signs, symptoms and management with contemporary relevance.• Detailed study of Allergies including allergic manifestations in the eyes, nose, lungs and skin• Fundamental Principles for treatment of poisoning• <i>Chaturvinshati Upakrama</i> (24 management procedures).• Extra -corporeal techniques (dialysis etc) for removal of poisons. <p>Emergency medical management of poisoning including preparation, administration and complications of anti-venoms /anti-sera</p> <ul style="list-style-type: none">• Descriptive study of <i>Sthavara visha</i>, definition, classifications, classical signs and symptoms of poisoning of <i>Sthavara visha</i> including <i>Vanaspatik</i> (phyto poison), <i>Khanija</i> (mineral)• General and specific treatment of different types of <i>Sthavara visha</i>.• Study of process for <i>Sodhana</i>, <i>Marana Sanskara</i> of poisonous drugs before therapeutic use. | 15 |
| 2. | <ul style="list-style-type: none">• Study of <i>Jangama visha</i> and their sources, descriptive study of ancient and contemporary knowledge of <i>Sarpavisha</i>, <i>Vrischika</i>, <i>Alarka</i> etc.their pathologic manifestations including their role as a causative factor in communicable diseases eg. vector borne diseases• General and specific treatment of different types of <i>Jangam visha</i>.• Detailed study of the contemporary knowledge about <i>Vishajanya Janpadodhvansaniya roga</i> (community health problems due to poisons & Environmental pollution, Water pollution, Soil pollution, Air pollution, Industrial pollutions, Agrochemicals toxicity etc). Their features and management according to ancient and recent concepts.• Concept of <i>Virudhaahar</i>, <i>Aahara visha</i> and <i>Satmy-Asatmyata</i> in contemporary and Ayurvedic views.• Management of food poisoning• Detailed study of <i>Madya visha</i> and substances acting on the nervous system; substance abuse. Their diagnosis, management | 15 |

| | | |
|----|--|----|
| | <ul style="list-style-type: none"> • Role of for Forensic Science Laboratory in suspected poisoning and medico-legal cases. <p>Duty of physician in cases of poisoning, suspected poisoning and their Post mortem findings</p> | |
| 3. | <ul style="list-style-type: none"> • Personal identity and its medico-legal aspects • Death and its medico-legal aspects (Forensic Thanatology) • Violent asphyxia deaths and its medico-legal importance. • Injuries due to various weapons, firearm, explosions, chemical and nuclear warfare, heat and cold, lightening and electricity and its Medico-legal aspects. • Virginitiy, Impotence, Sterility and their medico-legal aspects. • Regulations of Artificial Insemination and surrogate motherhood • Sexual offences and perversions. • Medico-legal aspects of, Pregnancy, Delivery, Abortion, Infanticide and Legitimacy with related acts • Medico legal aspects of mental illness | 15 |
| 4. | <ul style="list-style-type: none"> • Courts and Legal procedures • Study of medico-legal acts like Indian Evidence Act, Pre conceptional Pre Natal Diagnostic Test Act, Nursing Home Act, Human Organ Transplantation Act, Drugs and Cosmetic Act 1940, Narcotic drugs and Psychotropic substances Act 1985, Pharmacy Act 1948, Drugs and Magical Remedies (Objectionable Advertisements) Act 1954, Medicinal and Toilet Preparations Act 1955 and Anatomy Act etc. • Duties and privileges of physician as per ancient and contemporary science. • Professional secrecy and privileged communication. Professional negligence and malpractice. • Doctor - patient relationship. Rights and privileges of patients, Euthanasia. Consumer Protection Act related to medical practice • Indemnity Insurance scheme. • Structure of Central Council of Indian Medicine, its jurisdiction and functions. Code and Conducts as per the CCIM, Rules and Regulations there under. • Respective State Council of Indian Medicine, its structure, power, voluntary duties | 15 |

2.5 Rasashashtra and Bhaishjya Kalpana Vigyan

Marks- 100

Credit- 4 Credits - Hours – 60 hours [each credit- 15 hours].

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | <p>Dravyavargikaran And Parichaya [Classification and Pharmacognosy]</p> <ul style="list-style-type: none"> • Contemporary status of the branch Rasashastra and Bhaishajya kalpana. • Various systems of classification of drugs of natural origin i.e. medicinal plants, mineral ores, metals and animal products, specific terminology of the drugs [paryay and paribhasha] • Brief outline of occurrence, distribution, useful parts, identification tests, collection, preservation and storage methods of raw drugs. • Introduction to pharmacognosy of all types of Dravya – ahara and aushadha - traditional and modern • Detail study of ahardravyavarga, aharakalpana and concept of pathyapathya kalpana. Developments regarding functional foods, nutraceuticals, and therapeutic foods | 10 |
| 2. | <p>Kalpanirman siddhant [Principles of Pharmaceutics]: Metrology: Systems of weights and measures. Ayurvedic methods of measurement, Manparibhasha. Metric System and Calculations including conversion from one to another system and percentage calculations</p> <p>Introduction of pharmaceutical applications/procedures of drugs from all categories</p> <p>Basic Principles of Formulations of herbal drugs and mineral drugs. Fundamental dosage forms: [Panchavidhakashay, advanced and modified kalpana] and mineral drugs [Shuddha Dravya, Bhasma, Satva, Druti, and Parad Kalpana</p> <p>Basic principles of pharmaceutical chemistry</p> <p>Packaging of Pharmaceuticals – Desirable features of a</p> | 20 |

| | | |
|-----------|---|-----------|
| | <p>container.</p> <p>Types of containers. Study of glass & plastic as materials for containers & rubber as material for closure. Merits & demerits of storage materials. Information regarding traditional packaging & storage materials, their merits & demerits.</p> | |
| 3. | <p>Aushdhi Karmukata Vichar [Pharmacology]</p> <ul style="list-style-type: none"> • Introduction to Ayurvedic Pharmacology (rasa virya vipaka guna karma) & its scope. Pharmacological classification and action of drugs according to srotasa. • Routes of Drug administration their advantages & disadvantages of Bheshajprayogmarga, Bheshajaprayoga kal. [Posology] • Ayurvedic drugs and formulations used for various new conditions, syndromes, and infectious diseases like thyroids, CAD, swine flue, COVID 19 | 20 |
| 4. | <p>Itihas and Vangamaya [Literature: ancient and modern]</p> <ul style="list-style-type: none"> • History of [Bheshaja] drug in man. Definition, chronological review of Rasabhaishajyakalpana and its scope in indigenous system of medicine. • Introduction to pharmacopoeias with special reference to Indian pharmacopoeias. • Drug research guidelines and phases. • Most researched rasa drugs and the rationale for the same • Research regarding concepts of Rasa shastra and Bhaishajya Kalpana. • Various Research models to evaluate safety and efficacy of Rasa dravya. • Evidences against safety and efficacy of Herbo-mineral / metallic formulations and their interpretation • Publication and research writing particular to RSBK • Concerns expressed by non-Ayurvedic scientists on making of and use of mercurial metallic / herbo-mineral formulations in therapeutics | 10 |

2.6 Dravya Guna Vigyan

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | Pharmacognosy- Importance and different methods of classification according to Ayurved and modern and Namrupavigyan | 4 |
| 2. | Brief knowledge regarding controversy, substitutes and adulterants of herbal drugs, Neutraceuticals, Cosmoceuticals, food addictives etc. | 4 |
| 3. | Gunakarma Vigyan- Applied aspect of fundamentals of Dravya gunavigyan- Rasa, Guna, Veerya, Vipaka- Knowledge & interpretation of Bruhatrayi, Laghutrayi along with their Commentators | 4 |
| 4. | Karma- Vigyan-Comprehensive study of karma as defined in Brihatrayee & Laghutrayee | 4 |
| 5. | Prashasta Bhesaja Parikshana as per Charakacharya Standardization of crude drugs- [as per Ayurved pharmacopeia & WHO guideline]- Pharmacognostical study of different parts of the plants with reference to Macroscopic and microscopic study and Qualitative and Quantitative analysis like foreign matter, extractive (water and alcohol), ash value, acid insoluble ash and TLC separation.; Methods of drugs Standardization and Quality control; Biomarkers | 5 |
| 6. | Knowledge of clinical pharmacology and clinical drug research as per GCP guidelines | 3 |
| 7. | Sandighdravya & Anuktadravya- Knowledge of methodology and guna and karma of anuktadravyas | 3 |
| 8. | Toxic drugs-Purification of Poisonous plants- Studies on changes occurring in purification of poisonous plants drug | 2 |
| 9. | Study of Aharadravya | 5 |
| 10. | Principle of drug administration and drug delivery regimen, and clinical pharmacological evaluation [therapeutic administration] of drugs | 5 |
| 11. | Principles of clinical pharmacology and Introduction to reverse pharmacology | 3 |

| | | |
|-----|--|---|
| 12. | Experimental pharmacology- Introduction to experimental pharmacology with special reference to various drug activities | 3 |
| 13. | Brief knowledge regarding Pharmaco-vigilances-Knowledge of Pharmaco-vigilance in Ayurveda & modern medicine, Adverse drug reactions & drug interaction of medicinal plants, Drug incompatibility | 4 |
| 14. | Dashemanigana and Agryasangraha | 4 |
| 15. | TKDL (Traditional Knowledge of Digital Library) Various acts- Knowledge of TKDL, Introduction to relevant portions of following Acts – Good agricultural practices [GAP], Good field collection practices [G.F.C.P.] and Good storage practices [G.S.P.] Drugs and Cosmetic Act, Drug & Magic Remedies Act, FSSA (Food Safety and Standard Acts), AFA(Agriculture, Fisheries and Food Authority), Wildlife & Biodiversity Acts & Intellectual Property Right (IPR) and Regulations pertaining to Import and Export of Ayurvedic Drugs. | 5 |
| 16. | Bio- diversity- Knowledge of biodiversity, endangered medicinal species, threatened species | 2 |

2.7 Rog nidan and Vikriti vigyan

Marks- 100 Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | Concept of Vyadhi and its principal of classification. Concept of Anukta Vyadhi Nidan | 06 |
| 2. | Knowledge of Doshagati, Vyadhimarga, Vyadhiavastha and its application | 06 |
| 3. | Concept of Agni, Ama and its application | 06 |
| 4. | Concept of Srotas, its role in production of disease and its application | 06 |
| 5. | Concept of Vyadhi Hetu and its classification | 06 |
| 6. | Concept of Oja, Ojadusthi. Concept of Vyadhikshamatwa, Janapadodhwansa in Ayurved and its application in modern times | 06 |
| 7. | Rogapariksha (Nidan Panchak) and its application | 06 |
| 8. | Different methods of Rogipariksha and its application | 06 |
| 9. | Krividigyan in Ayurved | 06 |
| 10. | Concept of Geriatrics in Ayurved and geriatric disorders | 06 |

2.8 Swasthvritta

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Concept of holistic health <ul style="list-style-type: none"> • According to Ayurveda. • Spectrum of health, Iceberg phenomenon of diseases, dimensions of health. | 02 |
| 2. | Applied aspect of Dinacharya and Ritucharya <ul style="list-style-type: none"> • Probable Physiologic effect of Dinacharyaprocedures. • Ritu pattern in various countries of the world and Changing environment and application of ritucharya concept. | 04 |
| 3. | Effect of ritus on health and preventive measures. <ol style="list-style-type: none"> 1. Ahara. 1. Concepts of Diet Ayurveda perceptive and its applied aspect. 2. Staple diet of various States of India. Staple diet of various countries in correlation with their climate and its study from ayurvedAaharperceptive. | 04 |
| 4. | Concept of Rasayana, vajikarana and its role in Swasthvritta. <ul style="list-style-type: none"> • Achara Rasayana, Nityarasayana. • Rasayana procedures for Swastha. • Vajeekarana for Swastha. | 02 |
| 5. | Concept of Vegas, types and the physiology behind each vega and vegadharana <p style="text-align: center;">.</p> | 02 |
| 6. | Concept of Trayopasthambha, and its role in Swasthvritta. | 01 |
| 7. | Occupational Health. Ergonomics. Role of Ayurveda in it | 01 |
| 8. | Vyadhikshamatva – <ul style="list-style-type: none"> • Modern and Ayurvedic concepts. • Immunization programmes. Possible contribution of Ayurveda. | 06 |
| 9. | Concept of community health. <ul style="list-style-type: none"> • Ecology and community health. | 10 |

| | | |
|-----|--|----|
| | <ul style="list-style-type: none"> • Environment and community health. • Disposal of Wastes- Refuse, Sewage, bio medical waste management. | |
| 10. | <p>Concept of Epidemiology.</p> <ul style="list-style-type: none"> • Critical evaluation of Janapadodhwamsa. • Epidemiology of different Communicable diseases in detail. • Control of Epidemics. | 10 |
| 11. | <ul style="list-style-type: none"> • Demography and Family Planning. • Family Welfare Programme and the role of Ayurveda in it. | 08 |
| 12. | <p>National Health Programmes in Contribution of Ayurveda in National Health Programmes.</p> <ul style="list-style-type: none"> • Health administration under Ministry of H & FWD 15, AYUSH, NRHM, NUHM administration, functions and programmes. • Statistics related with Infectious diseases at International, National and State levels. • Vital Statistics. | 02 |
| 13. | <p>Yoga and Naturopathy.</p> <ul style="list-style-type: none"> • History and evolution of Yoga. • Different Schools of Yoga. • Physiological effect of Yoga on Body and mind – Ancient and modern concepts. • Therapeutic effect of yogic practice in the following. diseases - Diabetes, Hypertension, Cardiovascular disorders, Obesity, Asthma, Piles, Irritable Bowel Syndrome, Eczema, Psoriasis, Stress Disorders, Eye disorders, Head Ache, Juvenile Delinquency, Mental retardation, Depression, Neurosis, Sexual Dysfunction, Uterine Disorders, Cancer. • Basic Principles of Indian School of Nature Cure | 08 |

2.9 Kayachikitsa

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Basic Principles in clinical research of KAYACHIKITSA. Ayurvedic research methodology according to CharakVimanSthana, | 15 |
| 2 | Rasayan – Role and advances of rasayan in present scenario Vajikaran. a) Types b) Drugs used c) Uses d) Clinical significance | 15 |
| 3 | ChikitsaSiddhanta in charaksanhita and sushrutsanhita Shadividhopkram& their importance. a) Langhan b) Bruhan c) Rukshan d) Snehan e) Swedan f) Stambhan | 15 |
| 4 | Routs of Ayurvedic drug administration. a) Internal – Oral, Nasya, Basti, Vaman, Virechan. b) External – Abhyanga, Lepa, RaktaMokshan Ayurveda and national health programs. | 15 |

2.10 Panchakarma

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

| Sr. No. | Topic | Hours |
|---------|---|-------|
| 1. | Recent advances in Panchakarma and its instruments with Scope of researches in Panchakarma. | 5 |
| 2. | Importance of Poorvakarma in Shodhana Chikitsa. And various safety precautions related NABH | 5 |
| 3. | Vividha Rogeshu Vamanasyaupayogita with classical and recent advances. | 8 |
| 4. | Vividha Rogeshu Virechanasyaupayogita with classical and recent advances. | 8 |
| 5. | Vividha Rogeshu Bastiupayogita with classical and recent advances. | 4 |
| 6. | Vividha Rogeshu Nasyaupayogita with classical and recent advances. | 6 |
| 7. | Vividha Rogeshu Raktamokshanasyaupayogita with classical and recent advances. | 6 |
| 8. | Agnikarma , Ksharkarma and Viddhakarma | 4 |
| 9. | Various allied Panchakarma Therapies. | 4 |
| 10. | Role of Pashchatakarma. | 2 |
| 11. | Various aseptic precautions and care taken during Panchakarma procedures in present Era. | 2 |
| 12. | Basic principle of Physiotherapy. | 2 |
| 13. | Various instruments of Physiotherapy with Uses and Applications. | 4 |

2.11 Striro roga and Prasuti tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| No | Topic | Hours |
|----|---|----------|
| 1 | Grbha Garbhini Vigyan Recent advances in garbha-garbhini Recent Researches related to above subject | 15 hours |
| 2 | Prasuti tantra Recent advances in prasutitantra Recent Researches related to above subject | 15 hours |
| 3 | Streerog Recent advances in streerog Recent Researches related to above subject | 15 hours |
| 4 | Prasutitantrs evan Streerog shashtrakarma Recent advances in surgery Recent Researches related to above subject | 15 hours |

2.12 Kaumarbhritya tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| Sr. No. | Topics | Hours |
|---------|---|-------------|
| 1. | <p>Development of Kaumarbhrityatantra including ancient and modern literature. Strength of Ayurveda specific to child health care.</p> <p>Ayurvedic consideration of physiology and pathology of Dosha, Dhatu, Mala, Oja, Agni, Prakriti (sharirika-manasika), Kaya and Dhatuposhana in children.</p> <p>Basic Concepts of growth and development, and its assessment.</p> <p>Childhood Samskara and its scientific applications</p> <p>Principles of Child Psychology (Ayurvedic & modern concepts)</p> <p>Concept of BalaRasayana and its application in physical and mental health of children.</p> <p>Concept of Vyadhi-KshamatvaavamVardhanopaya. Concept of immunity and immune enhancing measures.</p> <p>Concept of Dhupana and Raksha karma and their clinical application in pediatric practice</p> | 15 Hours |
| 2. | <p>Fundamentals of Ayurvedic treatment for childhood disorders.</p> <p>Applied pharmacological considerations: Ayurvedic and modern concepts of drug doses, administration, distribution, metabolism, excretion, and other important factors of consideration.</p> <p>Basic concepts of single drugs commonly used in pediatric practice with special reference to their karma</p> | 15 Hours |

| | | |
|----|---|----------|
| | Kuposhanjanyaand ChayapachayaJanyaVyadhi | |
| 3. | <p>Specific considerations in research methods related to Pediatrics.Update knowledge of clinical pediatrics including recent researches in Kaumarbhritya.</p> <p>Regulatory laws related to child health management.</p> <p>Pediatric disabilities and Rehabilitation</p> <p>Fundamentals of Hospital management with special emphases on Pediatric Ward.</p> <p>Stanyadosha (Vitiation of Breast milk), StanyaShodhana (Purification of breast milk), StanyaJanana and Vardhanopakrama (Methods to enhance breast milk formation)</p> <p>Dhatri (Wet nurse) DhatriGuna and Dosha (Characteristics of Wet nurse), Concept of Breast Milk Banking.</p> <p>Specific Feeding methodology as per Ayurveda and recent advances for NavjatShishu</p> | 15 Hours |
| 4. | <p>Significant contributions of Kashyapasamhita, ArogyarakshaKalpadrum and other texts /treatises of Ayurveda such as HaritaSamhitain the field of Kaumarbhritya including relevant parts from Brihatrai</p> <p>Panchakarma: Principles of Panchakarma [Swedan–Hasta–Pataswedaetc], and their application in pediatric practice in detail.</p> <p>Balagraha: Scientific study of GrahaRogs</p> <p>YajjahPurushiya and Atulyagotriyaadhyaya of Charaka Samhita and applications related to it</p> <p>Measures for obtaining good progeny.</p> | 15 Hours |

2.13 Shalya tantra

Marks – 100

Credit – 4 credits-60 hours (each credit 15 hours)

| SR.NO. | TOPIC | HOURS |
|--------|--|-------|
| 1. | Sushruta Samhita | 01 |
| 2. | Sushruta Samhita commentaries | 01 |
| 3. | Tridosha vichara with special emphasis on Rakta as a Chaturtha Dosha | 02 |
| 4. | Chaturvidha Upakrama | 03 |
| 5. | Trividha Karma | 04 |
| 6. | Ashtavidha Shastrakarma | 04 |
| 7. | Basic principles of imaging techniques | 03 |
| 8. | Basic principles of anesthesia | 04 |
| 9. | Principles of management of Bhagna (Fractures) | 03 |
| 10. | Principles of management of acute abdomen | 02 |
| 11. | Principles of plastic and reconstructive surgery | 02 |
| 12. | Vranitopkrama & Vranitagara (Modern concept) | 01 |
| 13. | Marma vichara | 02 |
| 14. | Pathya Kalpana in Shalya | 01 |
| 15. | Specialities and contribution of Ayurveda in Shalyakarma | 02 |
| 16. | Recent advances in surgery | 05 |
| 17. | Special management of immune compromised patients (surgical perspective) | 02 |
| 18. | Special management of COVID 19 patients (surgical perspective) | 01 |

2.14 Shalakyta tantra

Marks- 100

Credit- 4 Credits - Hours – 60 hours[each credit- 15 hours]

NERTA

| Sr. No. | Topics | Hours |
|---------|--|-------|
| 1. | Applied anatomy and physiology of eye | 04 |
| 2. | Ocular pharmacology and roots of drug administration in ocular diseases, Kriyakalpas | 05 |
| 3 | Blindness- national program | 04 |
| 4 | Eye donation and Keratoplasty | 03 |
| 5 | Yantara – shastra. Diagnostic tools in Shalakyatanyra (eye) | 05 |
| 6 | Panchakarma in Shalakyatantra | 05 |
| 7 | Anaesthesia in shalakyatantra (eye) | 04 |

KARNA NASA MUKHAROGA

| Sr. No. | Topics | Hours |
|---------|---|-------|
| 1. | Applied anatomy and physiology of E.N.T. | 06 |
| 2 | Pharmacology in ENT and roots of drug administration in ENT diseases, Kriyakalpas | 04 |
| 3 | Deafness and tinnitus | 03 |
| 4 | Hearing Aids | 03 |
| 5 | Yantara – shastra. Diagnostic tools in Shalakyatanyra (ENT) | 05 |
| 6 | Panchakarma in Shalakyatantra (ENT) | 04 |
| 7 | Anaesthesia in shalakyatantra (ENT) | 05 |

Paper III

Literature survey and the review of the work done earlier on the topic of research presentation

100 marks

Reviewing of Published research work in area of Ph.D. topic will be a continuous process.

Evaluation and Assessment

1. The Examination for each paper will be of 100 marks with three hour duration.
2. The 3rd paper 'Reviewing of published Research' will be assessed based on the seminar to be given during the semester.
 - For paper third scholar has to give two presentations based on literature survey which will carry 50 marks each.
 - First presentation will be conducted by Research centre and the second presentation will be conducted in the presence of an external examiner and other the only presentation before Examiners.
3. Candidate should have secured 50 marks in each paper for passing.
4. No any practical examination for paper one and paper two, only theory examination will be conducted.
5. The result of the student shall be announced as pass or fail only.
6. If the student fails in one paper in Pre – Ph.D course Examination then he / she can allow to keep the term.

Syllabus for Course work for

Ph. D. Geoinformatics

Faculty of Interdisciplinary Studies

Effective from June 2017 onwards

Institute of Environment Education and Research

Bharati Vidyapeeth Deemed University, Pune

Bharati Vidyapeeth Deemed University
Faculty of Interdisciplinary Studies

Title: Course work for Ph. D Geoinformatics

Nature of the Course- The course work will consist of three papers, the details of which are given below. All the three papers are compulsory. The duration of the course work will be of one semester.

| | | | |
|----|--|-----------|----------|
| 1. | Paper 1: Research Methodology and ICT for Research | 4 credits | 60 hours |
| 2. | Paper 2: Recent Advances in Geoinformatics | 4 credits | 60 hours |
| 3. | Paper 3: Literature Review | 2 credits | |

Assessment

1. The examination for each paper will be of 100 marks with three hours duration. Students have to attempt any five questions of the given choice of eight questions.
2. Paper 3 will be assessed based on two seminars – one in front of the internal research committee and the second in front of the examination committee.

Standard of passing

The candidate should secure minimum 50 marks in each paper including the seminar to get qualified to proceed further with the Ph. D. programme.

Attendance: 100% attendance is compulsory.

Paper I- Research Methodology and ICT for Research**(4 credits)**

| Unit | Topic | Hours |
|-------------|--|--------------|
| 1. | Basic concepts of Research Definition and basic concepts, objectives of research, Research approaches, types of research, techniques of research, hypothesisation, literature survey, selection of topic, compiling records. | (08) |
| 2. | Writing and Presentation Skills Different types of scientific documents, review paper, book reviews, research paper, thesis, project reports (for the scientific community and for funding agencies), and Conference report. Components of a research paper the IMRAD system, title, authors and addresses abstract, acknowledgements, references, tables and illustrations. Preparation for publications – submission of manuscript, ordering reprints. Presentation of research: Oral and poster presentation, presentation in conferences and symposia. Preparation and submission of research proposals to the funding agencies. | (14) |
| 3. | Plagiarism Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. | (04) |
| 4. | Statistics Definition, population and sample, sampling techniques and types of samples, statistics and parameters. Summarization of data and estimation. Measures of central tendency – Mean, Mode, Median Measures of dispersion – Variance and standard deviation. Estimation: Confidence interval Graphical representation and histograms. Hypothesis testing: Significance testing, student's test Chi square test. Analysis: ANOVA, Regression and correlation analysis. | (10) |
| 5. | Informatics Basics of Internet and Informatics: Telnet, FTP, e-mail, world wide web (WWW), navigating the www, search engines. Databases – definition, some examples of databases, database management systems. | (10) |

| | | |
|-----------|---|-------------|
| | Use of databases: Concepts, methods and calculations. Information retrieval from databases. Analysis and prediction. | |
| 6. | Patenting and Intellectual Property Introduction, patent laws, composition of patents, applying and obtaining patent, problems encountered. | (04) |

BOOKS RECOMMENDED

1. Bailey N.T.J. (1995) Statistical Methods in biology 3rd Edition. Cambridge low price Edition Cambridge university press.
2. Baxevanis A. D. and B. F. F. Ouellette, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins.
3. Bergeron B. (2003). Bioinformatics and Computing. Prentice Hall Inc. Eastern Economy Edition.
4. Bergey's Manual of Systematic bacteriology (2nd Ed.), Volume, 1 Springer.
5. Campbell R. C. : Statistics for Biologist, Cambridge University Press.
6. Day Robert A. : How to write and publish a scientific paper.
7. Dixit J. V. (1996) Principles and Practice of Biostatistics 1st Edn. M/s. Banarasidas Bhanot (Publisher).
8. Dixit M. (1999) Internet: an Introduction, Tata Mc Graw Hills Series.
9. Dwyer. R. A. (2003) Genomic Perl. From Bioinformatics: Basics to working code. Cambridge University Press.
10. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier.
11. Gibaldi Joseph: MLA handbook for Writers of Research Papers.
12. Irwin H. Segel (1976) biochemical Calculations 2nd Edition John Wiley and Sons.
13. Khan and Khanum, (2008) Fundamentals of Biostatics, 3rd Revised Edition, Ukaaz Publication, Hyderabad.
14. Khan Imtiaz Alam: Elementary Bioinformatics, Pharma Book Syndicate.
15. Kothari R. C. Research Methodology, Methods and Techniques, 2nd revised edition, New Age International.
16. Prescott. S. C. and C. G. Dunn (2002) Industrial Microbiology. Publ. Agrobios. India Jodhpur
17. Ranjit Kumar: Research Methodology.
18. Reed, R. Homes, D; Weyers, J. and A. Jones. Practical skills in Bimolecular Sciences. Addison Wesley Longman Limited.
19. Simpson R. J. (2004) Purifying Proteins for Proteomics. A laboratory Manual. Cold spring Harbor laboratory press.
20. Sneath, P. H. A. Mair: N. S. Sharpe : M. E. and J. G. Holt (EDs) (1986), Bergey's Manual of Systematic bacteriology Vol. II Williams and Wilkins, Baltimore, London, Tokyo.
21. T. Bhaskararao (2002) Methods of Biostatistics. Paras Publishing.
22. Wardlaw A. C. (1985) Practical statistics for experimental Biologists John Wiley and Sons. Ltd.
23. Wayne Daniel: Biostatistics – A Foundation for Analysis of Health Sciences, John Wiley and Sons, Inc.
24. Wayne Goddard and Stuart Melville: Research methodology – An Introduction.
25. Westhead. D. R. Parish J. H. and R. M. Twyman (2003) Instant notes in 'Bioinformatics' Viva Books Private Ltd.

Paper 2- Recent Advances in Geoinformatics**(4 credits)**

| Unit | Topics | Hours |
|-------------|---|--------------|
| 1 | Mapping Techniques 1. Interpretation of SOI maps 3. Use of open source tools and mobile tools for data collection 4. Geovisualisation techniques | (5) |
| 2 | Techniques in GIS and digital image processing (COTS and Open source software) <ul style="list-style-type: none">• Using the analysis tools in ArcGIS/QGI• Performing multicriteria analysis• Object based classification• Unsupervised classification.• Supervised classification.• Knowledge based classification.• Model maker.• Change detection. | (10) |
| 3 | Techniques in database management <ul style="list-style-type: none">• Study of Relational Databases, Oracle SQL and PL/SQL• Study of various silent features in PostgreSQL or PostGIS• Creating a spatial database by using spatial queries• Import and export of spatial data and use of various Spatial SQL Queries• Producing maps from PostGIS• Executing SQL Query from pgAdmin III | (5) |
| 4. | Geospatial Modelling Basic concepts of modeling | (20) |

| | | |
|----|--|-------------|
| | <p>Ecological Modeling</p> <p>Vector based modeling</p> <p>Land change modeling</p> <p>Species modeling</p> | |
| 5. | <p>Programming for GIS</p> <ul style="list-style-type: none"> • Overview of Python programming • Understand Literals, variables, data types and functions. • Understand the concept of using and organizing Modules and Libraries in python application. • To create an application for understanding Decision making, looping, branching. • To create a programme for Implementing Object-Oriented Programming Techniques in Python. • To understand the structure and implementing of Struct, Arrays, String in an application. • To study of Client-side programming and Internet Data Handling • To study the overview of Web Programming using python. • Use of R | (20) |

BOOKS RECOMMENDED

- Koch Loney, Oracle 9i – The complete reference, Tata McGraw Hill, 2007
- Nanda Arup, Steven Feuerstein, Oracle PL/SQL for DBA, Shroff publishers and distributors pvt. Ltd., July 2008
- Feuerstein Steven, Pribyl, Oracle PL/SQL Programming, SPD publication, Fourth Edition, 2005
- Burrough P. A., R. A MacDonneli, Principles of Geographical Information Systems, Oxford University Press, 2000.
- Lo. C. P., A.W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice- Hall of India Pr. Ltd., 2002.
- Heywood I., S. Cornelius, S. Carrer, An Introduction to Geographical Information Systems, Pearson Education Pvt. Ltd, 2002.
- Kang-stung-Chang, Introduction to Geographical Information System, Tata McGraw Hill Pub. Comp, 2002.
- Demers M.N, Fundamentals of Geographic Information Systems, John Wiley & Sons, 2000.
- Roy P.S., Dwivedi R.S., Vijayan D., 2010 Remote Sensing Applications National Remote Sensing Centre, India
- Reddy, M.A., 2008. Textbook of remote sensing and geographical information systems. BS publications.
- El-Rabbany, A., 2002. Introduction to GPS: the global positioning system. Artech House.
- Arthur Robinson, H., 1958. Elements of cartography, John Wiley and Sons Inc.
 - Jensen John: Introductory Digital Image Processing-A remote sensing perspective, Prentice Hall Series, 2005