<div align="center">**RESEARCH PUBLICATIONS AND IPR (RPI)**</div>

Subject Code: RPPH-901

<div align="right">Duration-30 hrs, Credit-4</div>

Overview of the Course:

This course is mainly 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 (citations, h-index, Google Scholar, Research Gate, Pub-med, Impact fact) and the approved research journals.

Learning Outcome:

(a) Understanding of philosophy and ethics, Writing skills of good research paper
(b) Knowledge about various indexing platforms of research journals and to find out predatory research journals
(c) Different data bases Identify various categories of intellectual property law and apply the criteria for intellectual property protection to in academic and research activities;
(d) Understand the procedure involved in filing and prosecuting trademark, copyright and patent applications;

<div align="center">**Course Content**</div>

Unit-I: PHILOSOPHY, ETHICS AND SCIENTIFIC CONDUCT
Introduction to philosophy: definition, nature and scope, concept, branches, Ethics: definition, moral philosophy, nature of moral judgments and reactions. Ethics with respect to science and research, Intellectual honest and research integrity, Scientific misconducts: Falsification, Fabrication, and Manipulation, Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.

Unit-II: PUBLICATION ETHICS
Publication ethics: definition, introduction and importance, Best practices/standards setting initiatives and guidelines: COPE, WAME, *etc*., Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behavior and *vice versa*, types, Violation of publication ethics, authorship and contributor-ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals; Approved and peer reviewed Research journals

Unit-III: WRITING OF GOOD QUALITY RESEARCH PAPERS
What is good quality research paper in Science and Humanities, how to identify good research journal for publication of good quality of research, how to write good paper, interpretation of good research, presentation of data, original research, validation of original data, protection of original research, effect of publication of original research on patent filing. Open access publications and initiatives SHERPA-RoMEO online resource to check publisher copyright and self-archiving policies.

Unit-IV: DATABASES AND RESEARCH METRICS
Databases: Indexing databases, Citation databases: Web of Science, Scopus, *etc.*, Research Metrics: Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score. Metrics: h-index, g index, i10 index, Altmetrics, Google Scholar, Research Gate, Pub-med *etc*.

Unit-V: INTELLECTUAL PROPERTY RIGHTS
History of intellectual property and various conventions governing IPR, Key concepts of copyright and trademarks law, Key concepts of patent law, Advisory on filing and prosecuting copyright, trademark application and Patent application applications.

1. Sana Loue, *Research Ethics: Theory and Practice,*
2. Jasanoff, S.. *The Ethics of Invention: Technology and the Human Future*
3. R Subramanian, *Professional Ethics*, Oxford University Press.
4. Premvir Kapoor, *Professional Ethics and Human Values*, Khanna Book Publishing
5. R.R. Gaur, R. Sangal, G.P. Bagaria. *A Foundation Course in Human Values and Professional Ethics,* Excel Books, Delhi.

6. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, Delmar Cengage Learning

Ph.D. CHEMISTRY COURSE WORK SYLLABUS
w.e.f. 2020-21

Subject: Recent Trends in Chemistry
Subject Code: CYPH- 902

Objectives:
1. To provide the best education and career opportunity for a student with the best cultural and nurturing environment conducive to learning and scholarly activities.
2. To prepare students for development of methods of independent and systematic investigations leading to scientific discoveries.
3. To prepare students for a successful career at academic institutions, industrial and business entities, and governmental agencies.
4. To promote professional development and growth of the scholar.

Course Outcome:
1. In-depth knowledge in one main chemistry field with sufficient background in two related fields through advanced course work and laboratory research.
2. Student carry out independent chemistry research with competency in research design, data gathering and interpretation, and communication of research results through scientific publications and presentations. Able to organize and complete a quality written dissertation including laboratory and literature research.
3. Competitive professional employment in academia, industry, consulting, government, and teaching at the institutional level.
4. Understanding and awareness of professional, ethical and safety applications of their knowledge. Develop and understand the ethical and social dimension of science and the role and responsibility of chemistry for the advancement of the society.

UNIT-I:
NANOMATERIALS: Definition, Types of nanostructures, Properties and Applications: One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties, application as ferroelectric materials, coating, biological and environmental, membrane based application, polymer based application, nano catalysis, basic principle. Synthesis and preparation of Nanomaterials and Synthetic Techniques: Synthesis of bulk nanostructured materials.

UNIT-II:
ENVIRONMENTAL NANO-SCIENCE: The environmental effects of carbon-based nanomaterials. Nano sensors: Introduction to sensors. Characteristics and terminology - static and dynamic characteristics. Micro and nano-sensors, Fundamentals of sensors, Packaging and characterization of sensors, Organic and inorganic nano sensors, Biosensors: generation of biosensors, Nanomaterial based biosensors.Introduction of Green Chemistry.

UNIT-III
Supramolecular Chemistry:
Principles of molecular recognition: Quantification of non-covalent forces and medium effects; Host design; Preorganization; Enthalpy and entropic contributions; Cooperativity and allosteric effects.**Supramolecular Chemistry of Life:** Alkali metal cations in biochemistry; Porphyrins and tetrapyrrole macrocycles; Plant

photosynthesis; Uptake and transport of oxygen in Haemoglobin; Coenzyme B12; Neurotransmitters and Hormones, DNA; Biochemical self-assembly. **Supramolecular reactivity and catalysis**.

UNIT-IV
Chemical and Electrochemical Kinetics and Environment Related Electrochemistry: Fuel cells; Solar cells (photochemical, photovoltaic. Corrosion & waste removal techniques. Electrochemical Techniques: Impedance measurements; AC Voltametry. Reaction Dynamics Factors affecting the chemical reaction rate: temperature, ionic strength of the solution, catalyst, pH and dielectric constant of the medium, micelle. Determination of rate constant by stopped flow method & relaxation method; Flash photolysis & use of LASER.

UNIT-V
Advanced Tools & Techniques in Chemistry: Introduction of UV-Visible Spectrophotometry, IR Spectrophotometry, NMR Spectroscopy, Mass Spectrophotometry, ESR spectroscopy. Application of Spectroscopic Studies in Chemical Research Advanced treatment of IR and UV-Visible Spectroscopy.

Reference Books:
1. Dieter Vollath, "Nanomaterials: An Introduction to Synthesis, Properties and Applications", Wiley publication, 2nd Edition, 2013 (ISBN: 978-3-527-67186-1)
2. Satinder Kaur Brar, Tian C. Zhang, Mausam Verma, Rao Y. Surampalli and Rajeshwar D. Tyagi, "Nanomaterials in the Environment", American Society of Civil Engineers, 2015
3. Chaudhery Mustansar Hussain and Ajay Kumar Mishra, "Nanotechnology in Environmental Science", Wiley publication, 2018 (DOI:10.1002/9783527808854)
4. Katsuhiko Ariga and Toyoki Kunitake, "Supramolecular Chemistry-Fundamentals and Applications", Springer, 2006
5. Jean-Marie Lehn, "Supramolecular Chemistry: Concepts and Perspectives", John Wiley & Sons, 2011 (ISBN: 978-3-527-29311-7)
6. Christopher M. A. Brett and Ana Maria Oliveira Brett, "Electrochemistry: Principles, Methods, and Applications", Oxford University Press, 1993
7. Cynthia G. Zoski, "Handbook of Electrochemistry", Elsevier publication, 2007
8. Frank A. Settle, "Handbook of Instrumental Techniques for Analytical Chemistry", Prentice Hall, 1997
9. Jessica Carol, "Analytical Chemistry: Tools, Techniques and Applications", NY Research Press, 2016
10. Gnter Gauglitz and David S. Moore, "Handbook of Spectroscopy", 2nd Enlarged Edition (Vol 1), 2014

Ph.D. Syllabus
Advances in Computer Science
Subject Code: CSPH-901

Course objectives
This course provides students with an opportunity to learn the advances of data mining, software engineering, web information retrieval and system software, and explore the research issues therein.

Course outcomes
By the end of the course the students will be able to:-
CO1: Analyze and evaluate the data mining results by using different performance evaluators and present the derived results by using different presentation tools.
CO2: Knowledge of various Software Testing techniques and use of Software Testing Strategies & Metrics for Software testing.
CO3: Knowledge of Software Reliability, and Software Quality Assurance and knowledge of Quality management standards and methods.
CO4: To use knowledge of data structures and indexing methods in information retrieval Systems and to choose searching techniques for different data base systems
CO5: To Explain different types of search algorithms like Hardware text search systems and software text search systems

Unit 1. Advanced Data Mining: Introduction of Data mining, Need of Data Mining, Data Mining: An Overview from Database Perspective, Data Mining Process, Data Mining Algorithms, Constraints Based Data Mining, The Inter Disciplinary Nature of Data Mining, Knowledge Discovery in Database Process, Classification of Data Mining Techniques

Unit 2. Software Engineering: Software engineering overview, Software process models, Software Project Management, Software requirements, Software design, Analysis and design tools, Software design strategies, Software user interface design, Software design complexities, Software Implementation, Software Testing.

Unit 3. Web Information Retrieval-1: Searching techniques, Boolean retrieval, Ranked retrieval, Boolean queries, Tokenization,

Unit 4. Web Information Retrieval-2: Crawling, Search engines, Architecture of search engines, Search tools, Web crawlers and its types.

Unit 5. System Software: System Software, Linkers, Loaders, Text Editors, Macro Pre-processors, Assemblers.

REFERENCES
1. Christopher D. Manning, Hinrich Schütze, and Prabhakar Raghavan, "Introduction to information retrieval", Publisher: Cambridge University Press.

2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Publisher: morgan Kaufmann.

3. Roger Pressman "Software Engineering: A Practitioner's Approach", *Publisher*: McGraw Hill

4. Marcia J. Bates, "Understanding Information Retrieval Systems: Management, Types, and Standards", Auerbach Publications

5. John J. Donovan, "Systems Programming", Tata McGraw Hill, 2007.

6. D. M. Dhamdhere, "System Programming and Operating Systems", 2ond Edition, Tata McGraw-Hill, 2008.

7. eResources

SYLLABUS

Economics (Ph.D.)

Subject Code: BSEPH-901

Unit 1: Micro and Macro Economics

- Consumer Demand Theory: Choice under Certainty and Uncertainty
- Theory of Production and Cost
- Inflation and Unemployment in the Closed and Open Economy

Unit 2: International Trade, International Finance, Corporate Finance

- Modern theory of trade and trade Policy,
- Intra-Industry Trade, Free Trade versus Protection, Analysis of gains from free trade.
- Theories of Balance of Payment and exchange rate determination
- Modern Investment Theory

Unit 3: Development and Growth Theory

- Theories of under-development
- Classical Growth Models
- Endogenous Growth Models
- Sustainable Development

Unit 4: Economic Issues and Policy-I

- Planning and Economic Reforms
- Financing of Infrastructure Development, Education Sector
- PSUs, Privatization and Disinvestment
- Fiscal and Monetary Policy Approaches
- Financial Sector Reforms, Money and Capital market.
- World Trade Organization (WTO) and Indian Competition Policy.

Unit 5: Economic Issues and Policy-II

- Poverty, Income Distribution and Justice
- Migration and Demographic Transition
- Land Reforms in India and their impact on Agrarian Structure

Suggested Readings:

- Varian, Hall R., (1992), Microeconomic Analysis (Third Edition), W.W. Norton

- Salvatore, Dominick, International Economics, 6th Edition (1998) Prentice Hall, 7th and 8th Editions (2001 and 2004) John Wiley & Sons.

- Government of India, Ministry of Finance, Economic Devision Economic Survey- various issues

Contemporary Literary Thought and Critical Approaches (ENPH-901)

UNIT-I: **[8 Hours]**
New Literature In English,SOUTH ASIA: R.K. Narayan from The Man-Eater of Malgudi, Vikram Seth from A Suitable Boy,Alamgir Hashmi 'So What If I Live in a House Made by Idiots.

UNIT-II: **[8Hours]**
Introduction to Adaptation and Comparative Literature: Adaptation: Theory, Practice and Inter-textuality, Comparative Literature: Theoretical concepts, Scope and Relevance, Different Schools of Thought and Comparative Indian Literature.
Comparative Literature: Theoretical concepts, Scope and Relevance, Different Schools of Thought and Comparative Indian Literature

UNIT-III: **[9Hours]**
INDIAN LITERATURE IN ENGLISH (POETRY AND DRAMA) Objectives: Toru Dutt 'Sita' 'Lotus' Rabindranath Tagore Gitanjali (English Version) ,Nissim Ezekiel 'A Time to Change', 'Poet', 'Lover', 'Birdwatcher' Kamala Das 'Introduction', 'The Looking Glass'.

UNIT-IV: **[8 Hours]**
Contemporary Poetics: India and the World a. Introduction to Indian Poetics b. Introduction to Western Poetics.

UNIT-V: **[8 Hours]**
Indian Theory:A.K. Ramanujan. "Is there an Indian Way of Thinking?" Collected Essays of A.K. Ramanujan. Ed. Vinay Dharwadkar. Delhi: Oxford University Press 1999 pp. 34- 42

Suggested Reading

Dharwadkar, Vinay, ed. Collected Essays of A. K. Ramanujan. Delhi: Oxford University Press, 1999.

During, Simon, ed. The Cultural Studies: Reader. London: Routledge, 1993. Fanon, Frantz. The Wretched of the Earth. London: Penguin Books, 1963.

Zizek, Slavoj. Mapping Ideology. London: Verso, 1994.

Agger, Ben. Cultural Studies as Critical Theory. London: The Palmer Press, 1992.

Nicol, Bran, ed. Postmodernism and the Contemporary Novel: A Reader. Edinburg: Edinburg Univ Press, 1992.

Lodge, David, ed. Modern Criticism and Theory: A Reader. London: Longman, 1988. Bulletin of the American Academy of Arts and Sciences, Vol. 43, No. 4 (Jan., 1990), pp. 11-34

Mikhail Bakhtin. Problems of Doestoevsky's Poetics. Trans. Caryl Emerson, Manchester: Manchester Univ. Press, 1984.

Foucault, Michel. The Foucault Reader. Ed. Paul Robinow, London: Penguin Books, 1991.

Syllabus of Ph.D

FINANCE & COMMERCE

Subject Code: BSPH-911

Course Objective:

The objective of the course is to enable the scholar to explore emerging areas in the area of Finance that will facilitate in choosing an appropriate topic for research and understand the theoretical backdrop of his/her area of research. The course has been designed to provide the research scholar with knowledge of emerging issues and trends in financial markets and new innovations in the financial sector.

Course Outcome

CO1: Evaluate the emerging trends in finance.

CO2:Explain the concepts, tools and techniques applicable in the field of Investment and Portfolio Management

CO3: Examine the role of financial markets and would also understand the recent trends in the financial market.

CO 4 Understand the fundamental concepts and working of financial service institutions

CO5: Analyse the Indian banking system and the role of regulatory bodies in regulatingthem.

Course Content

Unit - 1

Emerging Trends in Finance

Behavioral Finance, Micro Financing in India, Financial Inclusion.

Venture Capital Financing: Theoretical Framework; and Indian Venture Capital Scenario,Financial Derivatives.Technology innovations in banking, rising stock of NPAs in commercial Banks.

Unit – 2

Investment Analysis and Portfolio Management

Investment vs. Speculation, Concept of portfolio, Portfolio management, Fundamental Analysis

Risk and Return: Conceptual Framework of Risk and Return: Type of Risks; Portfolio Selection; and Capital Asset Pricing Model (CAPM),

Unit - 3

Money and Capital Markets

Money market: Government securities market, instruments of money market - call money & notice money, treasury bills (TBs), commercial papers (CPs), certificate of deposits (CDs), commercial bills, repos.

Capital Market : Primary market, secondary market, Equity market, debt market, instruments of capital market, Stock Exchanges, SEBI

Unit - 4

Financial Institutions and Services

Financial Institutions: Development financial institutions, non-banking financial companies, mutual funds.

Financial Services: Merchant Banking, Lease and Hire-Purchase, Credit Rating, Depositaries, Factoring.

Unit - 5

Banking System in India:

Emerging scenario of Banking in India, Private and foreign Banks. Financial Innovation and Opportunities for Banks: Universal Banking, Banc assurance.

Regulation of Banking Sector: Role of RBI: Prudential Norms and performance measurement,

CRR, SLR, NPA. Risk Management in Banks

Suggested Readings:

1. James C Van home, Sanjay Dhamija, Financial Management and Policy, 13th ed., Pearson, New Delhi

2. Jonathan Berk, Peter, "Financial Management" Pearson.

3. Khan M Y : Indian Financial System, Macgraw Hill, New Delhi

4. Bhalla, V. K. (2009). Management of financial services. New Delhi: Anmol Publications.

5. Srivastava, R M : Financial Institutions in Indian Financial Institutions. 3rd revision ed. Himalya Publishing House, Mumbai

6. Beatriz Armendariz and Jonathan Morduch, "The Economics of Microfinance", PHI Learning, Delhi, 2005

7. Bhole, L M : Financial Institutions and Markets : Structure Growth and Innovations. 2nd

edition : New Delhi : McGraw Hill.

8. Eugene F. Brigham and Joel F. Houston, Fundamentals of Financial Management, concise 9th ed. (Indian Edition), now Cengage Learning, New Delhi, 2016

9. Reilly, Frank K., Keith C. Brown, 'Investment Analysis & Portfolio Management', 6th Edition,

South-Western College, USA, 2001.

School of Business Studies

Shobhit Deemed University, Meerut

Course: Ph.D

Subject Name: Human Resource Management

Subject Code: BSPH-912

Course Objective: The objective of the course is to enable the scholar to explore emerging areas in the area of Human resource that will facilitate in choosing an appropriate topic for research and understand the theoretical backdrop of his/her area of research. The course has been designed to provide the research students with knowledge of emerging issues and trends and new innovations in the field of human resource. The course also aims at providing an international perspective in the field to the students.

Course Outcomes: Upon the successful completion of this course, the student will be able to:

CO1: Acquire understanding of the Human Resource Management conceptual framework and its relevance in the organizations.

CO2: To understand various facts and facets of managing people, policies and practices of the organization.

CO3: Analyze the strategic issues and strategies required to select and maintain manpower resources.

CO4: To understand various HR concepts along with the domain concept in order to take correct business decision.

CO5: Evaluate the emerging role of human resources in the global arena.

CO6: Conduct research, produce reports and recommend changes in human resource practices.

Course Contents

Unit 1: Emerging Issues in HRM

HRM as a Central Sub-System, HRM and Competitive Advantage, Organization Socialization process, Flexible work-arrangement

Unit 2: Managing Strategic Organizational Renewal

Organization Culture, Organization Change, Work-force diversity, Human Resource Outsourcing, Managing change and Organizational Development

Unit 3: Introduction to Strategic HRM

Evolution of Strategic Human Resource Management, Components and Key features of SHRM, Aligning HR Strategy to Corporate Strategy

Unit 4: Instituting Strategic Issues

Total Quality Management Programmes, Creating Team-based Organizations, HR and Business Process Re-engineering

Unit 5: Managing Global Human Resources

International Human Resource Management, Improving International assignments through Selections, Training and Maintaining International Employees, Management values & philosophy

Suggested Readings:

1. Gary Desseler and Biju Varkkey, Human Resource Management, 15th ed. (2017), Pearson India Education Service, India Adaptation, Noida
2. John M. Ivancevich, Human Resource Management, 11th ed., 2016, McGraw Hill
3. Gomez-Mejia, David B. Balkin, Robert L. Cardy, Managing Human Resources, 8th ed. Pearson Education
4. Scott A. Snell and George Bohlander, *Human Resource Management*, Cengage Learning, 17th ed. New Delhi, 2017
5. Charles Greer, Strategic HRM, Pearson Education Asia, New Delhi.
6. Jeffery Mello, Strategic HRM, Thompson Publication, New Delhi.

Legal Education and Research Methodology

Sub. Code: RMLW – 901

Course Objectives

a) To familiarize participants with basic of research and the research process.

b) To enable the participants in conducting research work and formulating research synopsis and report.

c) To identify a research problem, selection of data, formulation of a research question, identification and justification of the relevance of the research topic, selection of a research method that best fits with the research topic.

d) To impart knowledge for enabling students to develop data analytics skills and meaningful

 interpretation to the data sets so as to solve the Research problem.

Learning Outcomes :

Upon successful completion of the course scholars are expected to:

1. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.
2. Know the main approaches in legal methodology, have basic knowledge on qualitative research techniques
3. Have adequate knowledge of the key issues of disciplinary and interdisciplinary legal research.
4. Develop an adequate literature review and identify relevant references to formulate a theoretical framework in accordance with the research topic.
5. Choose key primary and secondary legal sources (databases, official websites on international law, European law, and other international organizations).

Unit I: Introductory
Legal Research: Meaning purpose and types of research, Significance of research in law.

Unit II: Research Methods
Social Legal Research, Doctrinal and non-doctrinal, Relevance of empirical research in law.

Unit III: Identification of Problem of research
What is a research problem? Legislative materials including subordinate legislation, notification and policy statements, Decisional materials including foreign decisions; methods of discovering the, "rule of the case" tracing the history of important cases and ensuring that these have not been over-ruled; discovering judicial conflict in the area pertaining to the research problem and the reasons thereof, Juristic Writings – a survey of juristic literature relevant to select problems in India and foreign periodicals, Compilation of list of reports or special studies conducted relevant to the problem.

Unit IV: Preparation of the Research Design
Formulation of the Research problem, Devising tools and techniques for collection of data: Methodology, Methods for the collection of statutory and case materials and juristic Literature, Use of historical and comparative research materials, Use of observation studies
Use of questionnaires/interview, Use of case studies, Sampling procedures – design of sample, types of sampling to be adopted, Use of scaling techniques, Jurimetrics, Computerized Research – A study of legal research programmes such as, Lexis and West law coding, Classification and tabulation of data – use of cards for data collection – Rules for tabulation, Explanation of tabulated data, Analysis of data.

Unit – IV: Conduct of Research
Supervision, Guidelines for researchers

Bibliography
1. S.K.Agrawal (Ed.), Legal Education in India (1973), Tripathi, Bombay.
2. N.R.Madhava Menon, (ed) A Handbook of Clinical Legal Education, (1998) Eastern Book Company, Lucknow.
3. M.O.Price, H.Bitner and Bysiewiez, Effective Legal Research (1978)
4. Pauline V. Young Scientific Social Survey and Research , (1962)
5. William J. Grade and Paul K.Hatt, Methods in Social Research, Mc Graw-Hill Book, Company, London
6. H.M.Hyman, Interviewing in Social Research (1965)
7. Payne, The Art of Asking Questions (1965)
8. Erwin C.Surrency, B.Fielf and J.Crea, A Guide to Legal Research (1959)
9. Morris L.Cohan, Legal Research in Nutshell, (1996), West Publishing Co.
10. Havard Law Review Association, Uniform System of Citations.
ILI Publication, Legal Research and Methodology.

Subject Name: Recent Advances in Life Sciences
Subject Code: BTPH/MBPH/BIPH/AGPH/
AIPH/BMPH -901

UNIT-I: [8 Hours]
Plant Biotechnology: Laboratory requirementsand organization for plant tissue culture.Media formulation.Surface sterilization of explants. Callus and cell suspension culture, regeneration; organogenesis, somatic embryogenesis, Haploid Production, acclimatization and hardening. Applications of plant tissue culture and production of secondary metabolites.

UNIT-II: [8 Hours]
Medical Microbiology: Protocols for isolation and identification of Gram positive and Gram negative Bacteria-throat swab, urine and stool. Serological tests to culture of aerobic and anaerobic bacteria (Lactic Acid Bacteria), pathogenecity caused by Mycoplasma.Evolutionary importance of virus. Metagenomics for virus characterization: RNA and DNA virus

Unit-III: [8 Hours]
Recombinant DNA Technology: Preparation of different types of buffer, pH scale. Qualitative and Quantitative methods for estimation of DNA, carbohydrates, proteins and lipids. Techniques used for isolation of DNA from plants and checking DNA through Agarose gel electrophoresis. Analysis of carbohydrates through various quantitative methods. Protein estimation by Biuret, Bradford and Lowry method. Estimation of total lipids and fatty acids.

UNIT-IV: [8Hours]
Agriculture Sciences: Improved production technologies in agriculture, Integrated nutrient and water management, National problem in agriculture, commercial application of bio-regulators in agriculture, Plant protection measures, advanced research methodology in agriculture, value addition in post-harvest technology.

UNIT-V: [8 Hours]
Biological Techniques: Methods of separations of biomolecules:Chromatography, Centrifugation, Electrophoresis, spectroscopy techniques,UV and visiblespectrometry.Animal cell culture, Immunological Techniques:Preparation of antigen, antiserum and testing of immunological reactions using Immunodiffusion, Immunoelectrophoresis, Immunofluorescence, Immunoblotting (Western blotting), Immuno-electron microscopy.

UNIT-VI: [8 Hours]
Food Technology: Newer developments in food processing method - Minimal processing - Unconventional & non-thermal processing, Advances in low-temp processing & preservation, Advances in drying technology as a preservation method, Processing and preservation of alcoholic and non-alcoholic beverages, Advances in food packaging - Modified & active packaging - Aseptic packaging - Packaging for specialty foods, Food behavior surveys.

UNIT-VII: [8 Hours]
Biomedical Technology: Human physiology, Biomedical signal processing, Biosensors, Point of care technology, Biomedical Instrumentation, Embedded systems in Biomedical Engineering, Biomechanics, and Biomedical waste management.

UNIT-VIII: [8 Hours]

Environmental Technology: Bioremediation, biotransformation and biodegradation. Water pollution monitoring, Effluent treatment systems, Biotechnological application of hazardous waste management and management of resources.

UNIT-IX: **[8 Hours]**
History of Bioinformatics, Nucleotide and Protein sequence databases: NCBI, GeneBank, EMBL, DDBJ, Protein primary sequence databases and Secondary databases, Metabolic Pathways Databases, Pairwise Sequence Alignment: Local alignment and Global alignment Dot matrix, Dynamic Programming, Heuristic alignment algorithm: BLAST, FASTA.Multiple Sequence Alignment, Phylogenetic study, Homology Modelling, Micro array data analysis. Sequencing: Sanger, Next Gen Sequencing, Transcriptome sequencing.

UNIT-X: **[8 Hours]**
Role of ICT in agriculture, Agricultural and Rural Industries digitalization : Education and Skill development; Farm Health Management & Intelligence System for Plant Health, Animal Health, Soil Health and Water Quality etc.; Agricultural Marketing Information System; Precision Agriculture, Remote Sensing, Geo Information System, GPS technology applications in agriculture; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; Smartphone Apps in Agriculture for farm advises, market price.

REFERENCE BOOKS:
1. Wilson, K. and Walker, J. 1994. Principles and Techniques Practical Biochemistry, Cambridge University Press, Cambridge.
2. Willard, H.H., Meritt, L.L., Dean, J.A. and Settle, F.A. 1986. Instrumental method of analysis (7th eds.). Wadsworth Pub. Co., USA.
3. David W. Mount. Bioinformatics: Sequence and Genome analysis, Cold Spring Harbor Laboratory Press.
4. Jones, N.C. and Pevzner, P. A. 2004. An Introduction to Bioinformatics Algorithms. The MIT Press.
5. Shuler, M.L. and Kargi, F. 2002. Bioprocess Engineering (2nd eds.). Prentice-Hall of India, New Delhi.
6. Doran, P.M. 2009. Bioprocess Engineering Principles. Academic Press Elsevier.
7. Goldsby, R.A., Kindt, T.J. and Osborne, B.A. Kuby's Immunology (4th eds.). W H Freeman and Company.
8. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2008. Prescott, Harley and Klein's Microbiology (7th eds.). Mc Graw Hill, USA.
9. Process Heat Transfer (2nd edition) D. Q. Kern.
10. Batty, J.C. and Folkman, S.L. 1983. Food Engineering Fundamentals. John wiley and Sons, New York.
11. Fennema O.R. Ed. 1985, Principles of Food Science: Part-II Physical Principles of food Preservation. Marcel Dekker, New York.
12. Harper, J.C. 1975. Elements of Food Engineering. AVI, Westport.
13. Heldman, D.R. and Lund, D.B. Ed. 1992. Handbood of Food Engineering marcel Dekker, New York.
14. Bruce Rittman, Perry L. McCarty. Environmental Biotechnology: Principles and Applications. McGraw-Hill 2nd edition (July 25, 2000) ISBN: 0072345535.
15. Raina M. Maier , Ian L. Pepper, Charles P. Gerba. Environmental Microbiology. Publisher: Academic Press; (February 23, 2000).
16. Martin Alexander. Biodegradation and Bioremediation. Academic Press; 2nd edition (April 15, 1999) ISBN: 0120498618.
17. Gabriel Bitton (Author). Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd edition (February 16, 1999) ISBN: 0471320471.

18. W. Mount. Bioinformatics: Sequence and Genome analysis, Cold Spring Harbor Laboratory Press.
19. Jones, N.C. and Pevzner, P. A. 2004. An Introduction to Bioinformatics Algorithms. The MIT Press.
20. Chauhan, N.M. 2013. ICT in Agriculture: Opinion of the Farmers. Biotech Books.
21. Saravanan, R. 2011. Information and Communication Technology for Agriculture and Rural Development. New India Publishing Agency.
22. Jana, B.L. 2008. Precision Farming.Agrotech Publishing Academy.
23. Chakravarthy, R. 2006. Agri Informatics: An Introduction (Industry Series). ICFAI University Press.
24. Vanitha, G. &Kalpana, M. 2011. Agro-Informatics. New India Publishing House.
25. Gupta, R., 2008. E-Agriculture: Concepts and Applications. ICFAI University Press.

SYLLABUS

Marketing (Ph.D.)

Subject Code: BSPH 913

Course Objectives:

This course aims to introduce the students with the understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints. The course will develop skill to understand Consumer behavior, Segmentation, Targeting and Positioning and develop strategy Make the students understand the deeper aspects of successful services marketing. The course will further provide insights to the challenges and opportunities in services marketing.

The course will enable research scholar to explore emerging areas of Marketing that will facilitate in choosing an appropriate topic for research and understand the theoretical backdrop of his/her area of research.

Course Outcomes: On successful completion of course the student will be able to:

CO1.   To define the basic marketing concepts.

CO2.   To describe marketing Insights on application of basic marketing concepts concerning
4 P's – product, price, place and promotion.

CO3.   To describe the concept Services Marketing and Market Communication.

CO4.   To analyze the emerging field of Marketing so as to support his research problem.

UNIT-1 Marketing Mix

Nature and scope of Marketing, Concept of Product Decisions, Concept of Pricing Decisions, Physical Distribution and Distribution Channel Decisions, Promotion mix.

UNIT-2 Consumer Behaviour
Importance of understanding Consumer Behavior, Consumer decision-making process in buying, Consumers in the Social Context, Consumer Post Purchase Bahaviour.

UNIT-3 Marketing of Services and Marketing Communication
Services Marketing Mix, Strategies for Service Marketing, Recent Trends in Service Industries. Marketing Communication Models, Recent Trends and Issues in Marketing Communication.

UNIT-4 Digital Marketing

The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices. Role of branding, Mobile Marketing and Social Media Marketing.

UNIT-5 Emerging Trends and Issues in Marketing

Recent trends in Retail Management, Recent trends in Internet Marketing, Recent trends in Rural Marketing, Recent Trends in CRM.

Suggested Readings

1. Philip Kotler and Gary Armstrong, *Principle of Marketing,* 14th ed., Prentice-Hall of India, New Delhi, 2014
2. Consumer Behavior, Schiffman, L. G. and Kanuk, L. L., Pearson.
3. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
4. George E Belch & Michael A Blelch: Advertising and promotion- An integrated Marketing Communication Perspective-Mc Graw Hill Education.
5. Services Marketing, Zeithaml Valerie and Mary Jo Bitner, Gremler & Pandit, Tata McGraw Hill.

Mathematical Analysis

MAPH-906

Pre requisites- Nil

Purpose: To develop the analytical capability in the field of the mathematics through the learning of basic concepts and its applications. By the comprehension study, a student will enable to think logically about the research problems, which would help in the mathematical modeling as well as its analytical and numerical solutions.

Course Objective

1. Overview of basic concepts of fuzzy set, theory of operations and its relations.
2. To understand of basic concepts of fluid and its physical properties, Conservation laws, flow equations and Laminar flow of viscous incompressible fluids.
3. To study the various advanced numerical techniques for solving the ordinary and partial differential equations.
4. To understand the convex sets and its properties from the point of view of mathematical programming and optimization techniques.
5. To know the basic concepts of arithmetic and logical operators of Matlab software and use to develop the graphical representation.

Course Outcomes: At the end of the course students will

1. Knowledge about the concepts of fuzzy set and its operations and relations.
2. Memorize the concepts of fluid and its properties, laws of conservation, various flow problems and its equations.
3. Explain the numerical techniques for solving the ordinary and partial differential equations by the finite difference and finite element methods.
4. Interpret the optimization techniques and formulate the models to solve by linear programming.
5. Understand the arithmetic and logical operators of Matlab and develop a program of research problems for their graphical representation.

Unit-I
Fuzzy Sets: Basic definitions, α – level sets. Convex fuzzy sets. Basic operations on fuzzy sets. Types of fuzzy sets. Cartesian products. Bounded sum and difference. t- norms and t-conorm, Extension principle. Fuzzy relations and fuzzy graphs – fuzzy, relations on fuzzy sets. Fuzzy complements, combination of operations, aggregation operation. Fuzzy numbers, linguistic variables, arithmetic operations on intervals. Arithmetic operations on fuzzy numbers, fuzzy equations.

Unit-II
Flow Science: General concept of fluids and their properties, Continuum hypothesis, Constitutive equation of Newtonian fluids, Conservation laws: conservations of mass, conservation of momentum, conservation of moment of momentum, conservation of energy.
Introduction to Laminar viscous incompressible fluids: Plane couette flow, Plane Poiseuille flow, Generalize plane couette flow, Hagen Poiseuille flow, Flow between two coaxial cylinders.

Unit-III
Finite difference method: Finite difference approximations for derivatives, method for solving parabolic equations (Explicit, Implicit, Crank-Nicholson and Du-Fort Frankel schemes, ADI method to solve two-

dimensional equations) and their compatibility, convergence and stability, method for solving elliptic equations (SOR and ADI methods) and hyperbolic equations.
Finite Element Method: Weighted Residual methods: Collocation, least squares, Galerkins, Rayleigh-Ritz methods.

Unit-IV
Optimization Techniques: Linear Programming Problem, Kuhn-Tucker Condition, Quadratic programming problem, Non-linear optimization: Constrained and unconstrained optimization techniques, some direct search and indirect search methods.
Generalized convex functions, Multi-objective optimization: theory and computational methods. Decision making in fuzzy environment, Fuzzy optimization: theory and computational methods.

Unit-V
Matlab Basics: Introduction, arithmetic operations, display formats, elementary math bult-in functions, Variables, arrays, operations with arrays, functions for arrays, polynomials, system of linear equations, script files, operators, logical functions, 2-D plots, 3-D plots, print graphs, solution of differential equations.

Reference Books:
1. Zimmerman, H.J., "*Fuzzy set theory and its applications*", Allied publishers.
2. Klir, G.J. and Yuan, B., "*Fuzzy sets and fuzzy logic*", PHI.
3. Yuan S.W., "*Foundation of Fluid Mechanics*", PHI, New Delhi, 1976.
4. Betchelor G.K., "*An Introduction of Fluid Mechanics*", Oxford University Books, New Delhi, 1994.
5. Rathy R.K., "*An Introduction of Fluid Dynamics*", Oxford and IBH publishing Company, New Delhi, 1976.
6. Gerald, C. F. and Wheatly, P.O., "*Applied Numerical Analysis*". 6th Ed., Addison-Wesley Publishing 2002
7. Jain, M.K. "*Numerical Solution of Differential Equations*". John Wiley, 1991
8. Gupta, R.S. "*Elements of Numerical Analysis*". Macmillan India Ltd., New Delhi, 2009.
9. Nocedal, J. and Wright, S.J., "*Numerical Optimization*", Springer 1999.
10. Charnes, A. and Cooper, W.W., "*Mathematical Models and Industrial Applications of Linear Programming*", Vol. 1 & Vol 2, Wiley NY, 1961.
11. Schniederjans, M.J., "*Goal Programming: Methodology and Applications*", Kluwer Academic Publ.1995.
12. Lai, Y.J. and Hwang, C.L., "*Fuzzy Multiple Objective Decision Making: Methods and Applications*", Springer-Verlog 1994.
13. Goldberg, D.E., "*Genetic Algorithm in Search, Optimization and Machine Learning*", Pearson 2004.
14. Rudra Pratap, "*Getting Started with Matlab*", Oxford University Press, 2019
15. Gilat, A., "*Matlab an Introduction with Application*", John Wiley and Sons, 4th Ed. 2010.
16. Dukkipati, R.V., "*Applied Numerical Methods using Matlab*", New Age International (P) Ltd., 2011.

Program	Ph.D. Course Work
Course Code	MEPH-901
Course Name	
Credits:	4

Course Contents

Contact Hours

Unit 1 ***Materials Technology:Materials Engineering:***Metallic crystal structures, Imperfection in solids, Dislocation strengthening mechanisms and slip systems, Mechanisms behind strengthening of metals due to plastic deformation; Different heat treatment processes like annealing, tempering, normalizing and their effect on microstructure development vis-à-vis mechanical properties of metals and alloys. ***Testing of Materials:*** Testing, measurement and analysis of mechanical properties of materials through different mechanical testing processes like hardness, tensile, compression and toughness test; Overview of fatigue deformation behavior, fatigue testing of metals, measurement, analysis and representation of fatigue test data, fatigue failure analysis and effect of metallurgical parameters on fatigue failure; Overview of different types of non-destructive testing methods; their principles, processes and applications.

L-10

Unit 2 ***Thermodynamics:***Basic concept of thermodynamics, Zeroth law of thermodynamics, First law of thermodynamics, First Law for Cyclic & Non-cyclic processes, First Law for Flow Processes, Second law of thermodynamics, Entropy, Modes of heat transfer, Vapour power cycles and comparison with Carnot cycle, Basic concept of refrigeration, Air refrigeration system, Vapour compression system, Vapour refrigeration cycle.

L-6

Unit 3 ***Automobile Engineering:Engine System:*** Engine auxiliary systems, electronic injection for SI and CI engines, unit injector system, rotary distributor type and common rail direct injection system, transistor-based coil ignition & capacitive discharge ignition systems, turbo chargers (WGT, VGT), engine emission control by 3-way catalytic converter system. ***Transmission System:*** Transmission systems, clutch types & construction, gear boxes - manual and automatic gear shift mechanisms, overdrive, transfer box, flywheel, torque converter, propeller shaft, slip joints, universal joints, differential and rear axle.

L-8

Unit 4 ***Internal Combustion (IC) Engines:C.I. Engines:***Fuel supply system, types of fuel pump, injector and distribution system, Combustion in compression ignition engines, stages of combustion, factors affecting combustion, Phenomenon of knocking in CI engine. Effect of knocking, Types of combustion chambers rating of fuels in CI engines, Concepts of Supercharging and Turbo charging. ***Engine systems and components:*** Ignition system.(battery, magneto & electronic); Lubrication system; Engine starting system; Engine cooling system; Governing system (quality and quantity hit & miss governing); Intake and exhaust systems (two valves & four valves). ***Performance characteristics & Testing of I.C. Engines:***Standards for testing of I.C. Engine, mean effective pressure, indicated power, brake power, friction power, Methods to determine power and efficiencies; Variables affecting performance of engine, characteristic curves, heat balance sheet; Methods of improving engine performance.

L-10

Unit 5 ***Electric Vehicle: Overview of Electric Vehicle:***Concept of hybridization of automobile, Importance of different transportation development strategies to future oil supply, Basics and constituents of Electric Vehicle (EV), Basics and constituents of Fuel Cell Vehicles (FCVs), Importance of EVs and FCVs, EV fuel consumption, range,

L-6

and mpge; Carbon emissions for conventional and electric vehicles. ***General architectures of hybrid electric vehicles:*** Series Hybrid, Parallel Hybrid and Series–Parallel Hybrid; Series and Parallel Hybrid electric drivetrains coupling (Electrical & Mechanical Coupling), Layout of HEV systems, Hybrid electric vehicle system components.

Text Books/References:

1. Callister, W. D.,*Materials Science and Engineering-An Introduction,* 6th Edn., Wiley India, (2006).
2. Raghavan, V.,*Material Science and Engineering*. Prentice Hall of India Private Limited, (1999).
3. Dieter, G. E.,*Mechanical Metallurgy*, 3rd ed., McGraw Hill Education, (2016).
4. Nag, P.K, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd, (1995).
5. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., *Fundamentals ofThermodynamics,* 6th Edn., John Wiley and Sons, (2003).
6. Jones, J. B. and Duggan, R. E., *Engineering Thermodynamics*, Prentice-Hall of India, (1996).
7. Kirpal Singh, *Automobile Engineering*, 7th Edn, Standard Publishers, New Delhi, (1997).
8. Jain K.K. and Asthana R.B., *Automobile Engineering*, Tata McGraw Hill, New Delhi.
9. Heitner J., *Automotive Mechanics*, 2nd Edn., East-West Press, (1999).
10. Ganesan. V. Internal combustion engines: Tata Mc graw-Hill Publishing Company Limited.
11. Heywood, J. B. Internal combustion engine fundamentals: McGraw-Hill.
12. John G. Hayes, G. Abas Goodarzi,*Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles*, 1st Edn., Wiley Publication; (2018).
13. T. Denton, *Electric and Hybrid Vehicles*, 1st Edn, Institute of the Motor Industry, Routledge Publisher; (2016).
14. C. Mi, M. AbulMassur; Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives; 2nd Edn., Wiley Pubication, (2017).
15. M. Ehsani, Y Gao, S. Longo, K. M. Ebrahimi,*Modern Electric, Hybrid Electric, and Fuel Cell Vehicles*, 3rd Edn., Taylor & Francis Group, (2018).

Syllabus of Physics for Ph.D. Course work
(For Ph.D. in Physics, ECE & EE)
PHPH-901, ECPH-901, EEPH-901

Requisite: M.Sc. Physics/electronics

Objective: The course will provide a valuable theoretical introduction and an overview of the fundamental applications of the solids State. This course includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials (metals, semiconductors, dielectrics, magnetic materials and superconductors)

The objective of experimental particle physics is to accurately measure elementary particles. The primary method used to achieve this end is to produce these particles in high-energy collisions and then measure the products of using highly sensitive particle detectors. These experiments are used to test and revise scientific models of particle interactions. The purpose of this syllabus is to describe particle accelerators and detectors. Modern machines are based on earlier ones, so it is helpful to present a brief history of accelerators and detectors. It will also be helpful to solve the problems in nanoelectronics by providing the emerging fields of nanoscience and nanotechnology.

Unit- I (Transistors)
Bipolar Junction Transistors: Transistor amplifier, small signal Equivalent circuits (Hybrid-pi, Ebers moll), Graphical Analysis, Transistor as a switch cut off & saturation.
MOSFETS: Construction of Enhancement and Depletion mode MOSFET, MOSFET as an amplifier, Basic configurations of MOS amplifier, Analysis of Source follower.

Unit-II (Oscillators & Special Purpose Diodes)
Feed Back & Oscillators: Properties of negative feedback, four basic feedback topologies (series shunt; series-series; shunt-shunt; & shunt-series)
Special Purpose Diodes: LED, Varactor, Photodiode, Schottkey barrier, Tunnel diode, Gun diode (constructions and characteristics),

Unit III (Nuclear Detectors & Accelerators)
Introduction, Gas-filled ionization detectors, Proportional counters, Geiger-Muller counter, Semiconductor detectors, Solid State Nuclear Track Detector. Basic principles of acceleration, Classification of accelerators, Basic components and ion sources, Applications of accelerators, Electrostatic accelerators, Linear accelerators, Orbital accelerators (Conventional Cyclotrons)

Unit IV (Neutron Physics)
Discovery of neutron, Basic neutron properties, Classification of neutrons, Neutron sources, Interaction of neutron with nuclei, Interaction of neutron with matter in bulk, Neutron detectors, Neutron spectroscopy, Neutron diffusion, Ultra cold neutrons, Neutrons applications, Nuclear fission, Nuclear fusion, Nuclear reactors.

Unit-V (Nanoscience)

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano Technology. Introduction to Physics of Solid State, Quantum Theory For Nano Science: Time dependent and time independent Schrodinger wave equations, Growth Techniques of Nanomaterial, Buckey Ball: Nano structures of carbon(fullerene): Carbon nano-tubes: Fabrication , structure. electrical, mechanical, and vibrational properties and applications.

Outcomes: By the end of this course, students will be able to:
➢ Basic concepts of the band theory of solids will be given to Students, who will be able to predict the optical properties of materials and compounds
➢ Students will master their skills for oral presentations on the selected topics of the modern Solid State Theory.
➢ Compare and contrast different types of particle accelerators
➢ Describe the purpose, components, and function of a typical colliding beam machine.
➢ Explain the role of each type of sub detector of a typical multipurpose particle detector.
➢ Explain the role of nanoscience and nanotechnology in nuclear physics and electronics.

References:
1. Boylestad & Nashelsky "Electronic Device and Circuit."
2. Millman, J. and Grabel, A./"Microelectronics"/McGraw Hill.
3. Bell, David A/ "Electronic Devices & Circuits"/Prentice Hall (India) 4th Edition.
4. Fundamentals of Nuclear Physics by Jahan Singh, Pragati Prakashan, Meerut
5. Nuclear Radiation Detectors by J. Shorpe, Mathuen & Co. Ltd., London (1964)
6. Nuclear Radiation Detectors by S.S. Kapoor and V.S. Ramamurthy, Wiley Eastern Ltd., New Delhi.
7. Particle Accelerators by M.S. Livingston and J.P. Blewett, Mc Graw Hill Book Co. Inc. N.Y. (1962)
8. A Text Book of Nuclear Physics by C.M.H. Smith, Pergamon Press, Oxford (1966).
9. C.P.Poole Jr F.J. Owens, "Introduction to Nanotechnology".
10. "Introduction to S.S. Physics" - (7th Edn.) Wiley 1996.

SHOBHIT DEEMED TO BE UNIVERSITY
PhD Course Work

Current Trends in Psychology, Education, Yoga
PYPH-901, EDPH-901

Objectives – To acquaint students with contemporary issues in Psychology, Yoga and Education

Contents

Unit -1
- Rehabilitation Psychology- Meaning, definition and goals.
- Services for Rehabilitation for different groups.

Unit - 2
- Positive Psychology - Happiness and Wellbeing.
- Character Virtues and Strengths

Unit - 3
- Importance of Emotions in Human Life
- Positive Emotions
- Negative Emotions
- Managing Emotions

Unit - 4
- Contemporary Theories of Motivation and
- Contemporary Issues in Leadership.

Unit – 5
- Teacher Education- Meaning, Nature, Scope and Objectives
- Futuristic Views of Teacher Education.
- Training of Teachers for Special Schools, Inclusive Classrooms

Unit - 6
- ICT in Education**:** Concept and Principles
- Legal and ethical issues in use of ICT
- Using the web as a teaching-learning resource

Unit -7
- Issues in Education- Educational Paradigms: Empirical, Interpretive and Critical Perspectives.
- Epistemological, Metaphysical and Axiological issues in Education.
- Concept of holistic development

Unit – 8
- Changing profile of the teachers/teacher educators
- Role of Governing Bodies of Teacher Education (UGC, NCTE, State Government)
- New Education Policy 2020

Unit – 9
- Relevance of Yoga in contemporary life
- Philosophy for Yoga

Unit -10
- Importance of SukshmaVyayama, Shat Kriya, pranayama and meditation
- Significance of Surya namaskar

Suggested Readings

Winer B.J. *Statistical Principles in Experimental Design*(2nd Edition)- McGraw Hill
Broota K.D. - *Experimental Design in Behavioural Research*.
Kerlinger .*Foundations of Behavioural Research*
Frank et.al (2010) 2nd Edition *Handbook of Rehabilitation Psychology*
Robbin, Judge and Sanghi - *OrganisationalBehaviour* (12th edition) Prentice Hall

Syllabus (Research Methodology)

Subject Code: RMPH-901   **Duration: 30 hrs. Credit-4**

Course Objectives: The course is designed to develop a research orientation among the scholars and make them aware with the different research methods and techniques and to develop understanding the practical application of various research techniques.

Course Outcomes (COs): At the end of this course research scholars will be able to:

CO 1: Explain the basic framework of research process involved in research.

CO 2: Construct the research proposal related to research problems.

CO 3: Design the questionnaire related to primary data collection method.

CO 4: Operate the concept of statistical analysis which includes various tests like t-test, F Test, Z test.

CO 5: Identify the mechanism and techniques of thesis writing.

Course Contents

Unit-1 Survey Methodology

- Meaning and Importance of Research Methodology, Types of Research, Selection and Statement of Research Problem, Steps Involved in Research Process.
- Research Design: Exploratory Research Design, Descriptive Research Design and Experimental or Causal Research Design.
- Primary Data Collection Method (Interview Method, Observation Method, Questionnáire Method, Schedule Method), Preparation of Questionnáire.
- Secondary Data Collection Method
- Sampling Design (Probability and Non Probability Sampling Methods), Determination of Sample Size, Sampling and Non Sampling Errors.
- Scales of Measurement: Nominal, Ordinal, Interval and Ratio Scale
- **Case Studies based on Sampling Design, Collection of Data and Preparation of Questionnáire**

Unit-2 Use of Computer in Research

- Graphical Representation of Data
- Preparation of Histogram, Pie Chart from the data
- Use of PowerPoint and Excel in Research
- Processing of Data: Coding, Editing, Classification and Tabulation of Data

Unit-3 Application of Statistical Techniques/ tools for Analyzing & Testing the Data

- Meaning, Types and Formulation of Hypothesis
- Hypothesis Testing- Procedure of Hypothesis Testing
- Correlation Analysis and Regression Analysis
- Standard Deviation
- Application of chi-square test, Z test, t-test in testing of the hypothesis
- Concepts and Application of Analysis of Variance (ANOVA)

Unit-4 Research Report Writing

- Preparation of Synopsis (Layout of the synopsis)
- Collection of Literature (How to collect Literature)
- Citation of References
- Writing of Thesis (Introduction, Review of Literature, Methodology, Representation of Data, Interpretation and Discussion of results, Preparation of Summary).
- Research Proposal

Suggested Readings

1. Donald R. Cooper, Pamela S. Schindler (2013). *Business Research Methods*, 11th Edition TMGH, New Delhi.
2. Collis J and Hussy R. (2003). *Business Research*, Palgrave.
3. Saunders (2003). "*Research Methods for Business Students*", Pearson Education, 3rd edition.
4. Allen Bryman and Emma Bell (2015). "*Business Research Methods*", 4th ed., Oxford University Press.
5. Emma Bell, Alan Bryman and Bill Harley (2018). *Business Research Methods*, 5th ed., Oxford University Press.
6. Kothari C.R. (2011). *Research Methodology*, 2nd ed. (Revised), New Age International Publication.
7. Beri, G.C. (2013). *Marketing Research*, 5th Ed., Mc Graw Hill.