



THE COCHIN COLLEGE

Koovapadam, Kochi-2

Affiliated To Mahatma Gandhi University

Re-accredited by NAAC With B+ Grade



Fourth Cycle
NAAC Accreditation 2024

Criterion 1 Curricular Aspects

1.3 - Curriculum Enrichment

Metric No. 1.3.1

Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability in transacting the Curriculum.

PhD Coursework Syllabus Addressing Professional Ethics

Submitted to



National Assessment and Accreditation Council



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MAHATMA GANDHI UNIVERSITY

Ph.D. COURSE WORK SYLLABUS

Course (1)- Research Methodology

Syllabus Common to the stream : Science, Applied Science and Engineering

Unit 1 – Science and Research:

Definition – History – Evolution of Scientific Inquiry – Verification versus falsification – Objectivity : Facts, theory and concepts – Philosophy of Science and Technology, Epistemology of sciences – Construction of scientific facts.

Unit 2 - Introduction to Research Methodology

- Meaning and importance of Research – Types of Research – Selection and formulation of Research Problem
- Research Design – Need – Features – Inductive, Deductive and Development of models
- Developing a Research Plan – Exploration, Description, Diagnosis, Experimentation, Determining Experimental and Sample Designs.
- Analysis of Literature Review – Primary and Secondary Sources, Web sources –critical Literature Review
- Hypothesis – Different Types – Significance – Development of Working Hypothesis
- Research Methods: Scientific method vs Arbitrary Method, Logical Scientific Methods: Deductive, Inductive, Deductive-Inductive, pattern of Deductive – Inductive logical process – Different types of inductive logical methods.

Unit 3 - Data Collection and Analysis

- Sources of Data – Primary, Secondary and Tertiary – Types of Data – Categorical, nominal & Ordinal.
- Methods of Collecting Data : Observation, field investigations, Direct studies – Reports, Records or Experimental observations.
- Sampling methods – Data Processing and Analysis strategies- Graphical representation – Descriptive Analysis – Inferential Analysis- Correlation analysis





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– Least square method - Data Analysis using statistical package – Hypothesis – testing – Generalization and Interpretation – Modeling.

Unit 4 – Scientific Writing

- Structure and components of Scientific Reports – types of Report – Technical Reports and Thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports - Illustrations and tables – Bibliography, Referencing and foot notes – Oral presentation – Planning – Preparation and practice – Making presentation – Use of visual aids – Importance of Effective Communication.
- Conventions and strategies of Authentication – Citation Style - sheet
- Preparing Research papers for journals, Seminars and Conferences – Design of paper using TEMPLATE, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN.
- Preparation of Project Proposal - Title, Abstract, Introduction – Rationale, Objectives, Methodology – Time frame and work plan – Budget and Justification - References

Unit 5 – Application of Results and Ethics

Environmental Impacts - Ethical Issues – Ethical Committees – Commercialization – copy right – royalty – Intellectual Property rights and patent law – Track Related aspects of intellectual property Rights – Reproduction of published material – Plagiarism – Citation and Acknowledgement – Reproducibility and accountability.

Unit 6 – Application of Computer in Research

- MS office and its application in Research – MS Word, MS Power point and MS Excel
- Basic principles of Statistical Computation using SPSS
- Use of Internet in Research – Websites, search Engines, E-journal and E-Library – INFLIBNET.

References: Science

1. Garg.B.L., Karadia, R., Agarwal,F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R.(2008). Research Methodology: Methods and Techniques. Second Edition. New Age International Publishers, New Delhi.





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3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270 p.
5. Day RA (1992) How to write and publish a scientific paper. Cambridge University press. London
6. Hempel, C. Philosophy of Natural science Englewood Cliffs, N.J: Prentice Hall, 1966.
7. Burt, E.A. The Metaphysical Foundations of Modern Science. London, 2003.
8. Latour, B. & Woolgar. 3. Laboratory Life. The construction of scientific facts. 2nd Edition. Princeton: Princeton University Press. 1986
9. Gupta S.P. (2008). Statistical Methods. 37th ed. (Rev) Sultan Chand and Sons. New Delhi. 1470 p.
10. Sundar Sarukkai (2008) Indian Philosophy and Philosophy of Science, Motilal Banarsidass Publishers Pvt.Ltd. New Delhi.
11. Kozak A, Kozak R.A., Staudhammer C.L., and Watts S.B. (2008). Introductory probability and Statistics; Applications for forestry and Natural sciences. CAB International, UK. 408p.
12. Downie N.M Basic Statistical Methods. New York: Harper and Health Row Publishers,.....
13. Frank, Harry. Statistics. Concepts and Applications. Cambridge. Althoen, Steven Cambridge University.
14. Leon & Leon (2002). Internet for everyone, Vikas Publishing House.
15. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
16. Chandra A. and Sexena T.P. (2000) Style Manual, New Delhi, Metropolitan Book Comp. Ltd.
17. SPSS – Operating Manual and handbook – Latest version
18. Sinha P.K. (1992). Computer Fundamentals, BPB Publications, New Delhi.





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Course 1 – Research Methodology

Unit 1 – Foundations of Research

A brief history of Social Research – logical postivism, Axiology, Ontology, Positive Epistemology – Logical Preliminaries – Indian and Western Constructivist Paradigm – Transformative Paradigm – Pragmatic Paradigm – Merging Paradigms – Phenomenology

Unit 2 – Introduction to Research Methodology

Meaning and Importance of Research – Types of Research – Selection and formulation of Research Problem – Research Design – Ethical issues in Research -Critical Analysis of Literature Review – Hypothesis: Different Types of Hypothesis Research Methods; Historical, Institutional, Legal, Philosophical, Comparative, Ethical, Survey, Case study, Content Analysis, Experimental Methods, Triangulation, Mixed Method Research

Unit 3 – Data Collection

Source of Data – Primary, Secondary and Tertiary Data- Methods of Collecting Data – Observation, Questionnaire, Interview, Attitude Scales, Interest Inventories – Construction and Standardisation-Scaling Techniques – Different Types of Scales-Sampling – Different Types – Sampling Errors – Type I and Type II errors- Different Types of Variables

Unit 4 – Data Analysis & Interpretation Classification and Tabulation of Data – Graphical Representation-Descriptive Analysis: Central Tendency and Dispersion, Coefficient of Variation, Correlation and Regression Analysis-Inferential Analysis: Parametric and Non-Parametric tests, T-test, F-test, ANOVA, ANCOVA, Chi-square

Unit 5 – Report Writing/Project Proposal

Organisation of Research Report – Types, Structure and Components – Contents, Bibliography, Appendices-Style Manuals – APA style, MLA style, ASA style, The Chicago Manual of Style, etc.- Evaluation of Research Report-Preparing Research papers for journals, seminars and conferences-Preparation of Project Proposal – Title, Abstract, Introduction: Rationale, Objectives, Methodology – Time Frame and Work Plan – Budget and Justification – References

Unit 6 – Application of Results and Ethics

Environmental Impacts – Ethical Issues – Ethical Committees – Commercialization – Copy Right, Intellectual Property Rights – Reproduction of Published Material – Accountability

Unit 7 – Application of Computer in Research

- MS Office and its Application in Research – MS Word, MS Powerpoint and MS Excel
- Basic Principles of Statistical Computation using SPSS
- Use of Internet in Research – Websites, Search Engines, e-journal and e-library - INFLIBNET





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Ph.D COURSE WORK IN PHYSICS

COURSE II – RECENT DEVELOPMENTS IN PHYSICS

Unit I:

X-ray diffraction methods, Free electron theory in 3 dimensions, Fermi-Dirac distribution, Electrical conductivity and ohms law, Motion in magnetic fields-Hall effect, origin of energy gap, Kronig-Penny model, effective masses of electrons and holes in semiconductors, intrinsic carrier concentration, mobility, impurity conductivity, thermal ionization of donor and acceptor, Excitons: Frenkel and Mott-Wannier excitons, diamagnetism, paramagnetism, quantum theory of paramagnetism, Ferromagnetism: Ferromagnetic order-Curie point and exchange integral - spin waves - Ferromagnetic domains - coercivity and hysteresis, Ferroelectricity (**reference 1**) single domain particles: blocking temperature – superparamagnetism (**reference 2**)

(16 hours)

Unit II:

Optical processes in semiconductors-Electron-hole pair formation and recombination-radiative and no radiative recombination-band to band recombination, Absorption in semiconductors, indirect intrinsic transitions-exciton absorption, donor-acceptor and impurity-band absorption, low energy absorption, stokes shift in optical transitions of semiconductors, Near bandgap radiative transitions- Exciton recombination - Band to band recombination - donor acceptor and impurity band transitions, deep level transitions (reference 3)

Nonlinear optics- second order and third order non linear phenomena, propagation of electromagnetic wave through nonlinear media, second harmonic generation, optical parametric oscillator and four wave mixing. Two photon absorption, Stimulated Raman Scattering, Coherent anti-Stokes Raman scattering, (**reference 4, 5, 6**)

(16 hours)

Unit III

Nuclear Physics: Particle Physics: The quark model - Colored quarks and gluons – Reaction and decays in the quark model – Charm beauty and truth, quark dynamics, Grand unified theories. (**reference 7**)

Astrophysics: Cosmology, redshift and the expansion of the universe, Matter density in the universe and the deceleration parameter, The perfect cosmological principle, Fundamental equations of cosmology, Some important models of the universe – The static model of Einstein – The Lemaitre Universe- The Friedmann model – The Steady state Universe – The Scalar-tensor theory, Observation tests of cosmological models (**reference 8**)

(16 hours)





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Unit IV:

Classical Mechanics:- Relativistic field theories- examples of relativistic field theories, Noether's Theorem (**reference 9**) **Statistical Mechanics:-** The Boltzmann Transport Equation –H Theorem (**reference 10**), **Quantum Field Theory -** Klein-Gordon Equation – K-G interpretation of negative energies, Dirac Equation- conserved current- interpretation of negative energy (**reference 11**) **Electrodynamics:-** Structure of spacetime, space-time diagrams, Relativistic Electrodynamics-Magnetism as a relativistic phenomenon, How the field transforms, electromagnetic field tensor (**reference 12**)

(16 hours)

References:-

Unit I

1. Introduction to Solid State Physics (7th edition) - Charles Kittel
2. Magnetism in condensed matter (Oxford) - Stephen Blundell

Unit II

3. Semiconductor optoelectronic devices (2nd edition) - P. Bhattacharya
4. Non-linear Optics - N. Bloembergen
5. Contemporary nonlinear optics - G P Agarwal and R R Boyd
6. Molecular Structure and Spectroscopy - G. Aruldas

Unit III

7. Introductory Nuclear Physics - Kenneth S Krane
8. An Introduction to Astrophysics - Baidyanath Basu

Unit IV

9. Classical Mechanics (2nd edition) - Herbert Goldstein
10. Fundamentals of Statistical Mechanics - B. B. Laud
11. Modern Quantum Mechanics (2nd edition) - J J Sakurai and J Napolitano
12. Introduction to Electrodynamics (3rd edition) - David j. Griffiths





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Ph.D. COURSE WORK IN COMMERCE

COURSE II- MODERN TRENDS IN COMMERCE

MODULE 1

Business environment - economic environment - Political and legal environment - social and cultural environment – MSME - Globalisation - GATT/WTO and Trade Liberalisation - FDI and FPI-Balance of Payments- Impact of Globalization on Banking and financial Services.

MODULE 2

Financial management - time value of money - financing decision and capital structure - working capital management- cost of capital - capital budgeting - Leverage analysis - Dividend decisions – Recent development in corporate finance- Indian Financial System- Financial Markets – Financial Institutions – Financial Instruments-Recent Developments in Indian Financial system- Behavioral Finance- Rural Finance.

MODULE 3

Marketing concepts and functions - Marketing mix - Market segmentation - Market targeting - Market positioning - Product mix – PLC – Branding - Packaging and labeling-Pricing policies and strategies - Logistic and supply chain management - Marketing Research- Consumer Behaviour – Building Customer Relationship Management - Consumer Relationship Marketing (CRM)

MODULE 4

Human resource management - personal management vs human resource management - Human resource planning - job analysis – recruitment - principles of HRD - factors influencing productivity - Performance appraisal - Role of psychology in HRD and Management – Industrial psychology- Human Relations, Employees morale- Measures to improve morale- Job Satisfaction – Motivation – Theories – Leadership –Theories – Group Dynamics.

MODULE 5

Accounting standards – Concepts – Convention – International Accounting Standards- International Financial Reporting Standards - Analysis of Financial statements - Corporate Governance - Accounting for price level changes - Human Resource Accounting - Corporate Restructuring- Financial Re-engineering- Risk Management- Requirements on Capital Adequacy Norms in banks- Assets Quality- NPA.





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References:

- Cherunilam, Francis. *Business Environment*. Himalaya Publishing House, 2003.
- Dessler, Gary. *Human Resource Management*. Prentice Hall, n.d.
- Garrison, Ray, Eric Noreen and Peter Brewer. *Managerial Accounting*. n.d.
- Gupta, N.S, *Organisation Theory and Behaviour*, Himalayas Publishing House, New Delhi
- Jain, SP and K.L.Narang, *Advanced Financial Accounting*. Kalyani Publishers, n.d.
- Kotler, Philip and Abraham Koshy. *Principles of Marketing*. Pearson Education, n.d.
- Morrison, Janet, *Global Business Environment Meeting the Challenges*. Palgrave Macmillan, 2012.
- Peeru Mohamed, H & A Sagadevan,A, *Customer Relationship Management*, Vikas publication
- Rudrabasavaraj, *Dynamics for Personnel Administration*, Himalayas Publishing House, New Delhi.
- Stickney, Clyde P. and Roman L. Weil, *Financial Accounting: An Introduction to Concepts, Methods, and Uses*. South-Western College, n.d.
- Sundaram Sultan,K.P.M, *Money Banking, Foreign Exchange & International Trade*. S.Chand & Sons.
- Varma, Sumati, *International Business: Concepts, Environment, Structure & Strategy*. New Delhi: Ane Books Pvt. Ltd, 2010.





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Details of Course IV:-

COURSE TITLE

- Research and Publication Ethics (RPE)

COURSE LEVEL

- 2 credit course (30 Hrs.)

ELIGIBILITY

- M.Phil, Ph.D. students and interested faculty members (It will be made available to post-graduate students at later date)

FEES

- As per University Rules

FACULTY

- Interdisciplinary Studies

QUALIFICATION OF FACULTY MEMBERS OF THE COURSE

- Ph.D. in relevant subject areas having more than 10 years' of teaching experience

COURSE CODE

- CPE-RPE

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 (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

- Class room teaching, Guest Lecturers, group discussions and practical sessions.

Evaluation

- Continuous assessment will be done through tutorials, assignments, quizzes and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

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Course Structure

- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit Title	Teaching Hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Database and Research Metrics	7
Total		30

SYLLABUS IN DETAIL

Theory

- RPE 01: PHILOSOPHY AND ETHICS (3hrs)**
 1. Introduction to Philosophy: definition, nature and scope, concept, branches
 2. Ethics: Definition, moral philosophy, nature of moral judgements and reactions.
- RPE 02: SCIENTIFIC CONDUCT (5hrs.)**
 1. Ethics with respect to science and research
 2. Intellectual honesty and research integrity
 3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
 4. Redundant publications: duplicate and overlapping publications, salami slicing
 5. Selective reporting and misrepresentation of data
- RPE 03: PUBLICATION ETHICS (7 hrs.)**
 1. Publication ethics: definition, introduction and importance
 2. Best practices/standards setting initiatives and guidelines: COPE, WAME etc.
 3. Conflicts of interest
 4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types
 5. Violation of publication ethics, authorship and contributorship
 6. Identification of publication misconduct, complaints and appeals
 7. Predatory publishers and journals





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Practice

- **RPE 04: OPEN ACCESS PUBLISHING (4hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

- **RPE05: PUBLICATION MISCONDUCT (4 hrs.)**

- 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

- B. **Software tools (2 hrs.)**

1. Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7 hrs.)**

- A. **Databases (4hrs.)**

1. Indexing databases
2. Citation databases: Web of Science, Scopus etc.

- B. **Research Metrics (3hrs.)**

1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

The above said recommendations of the University Research Committee, vide the minutes read as (2) above, have been approved by the Vice-Chancellor, by exercising powers of the Academic Council, under Section 3.10(17) of Mahatma Gandhi University Act 1985.





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Orders are issued accordingly.

SURESHBABU K

ASSISTANT REGISTRAR IV

(ACADEMIC)

For REGISTRAR

Copy To

- (1) The Heads of all research centres
- (2) PS to the Vice-Chancellor
- (3) PS to the Pro-Vice-Chancellor
- (4) PA to Registrar
- (5) PA to Controller of Examinations
- (6) PA to Director, College Development Council
- (7) Director of Research
- (8) JR II (Admn), DR I (Acad), AR IV (Acad), JR I (Exams), AR XXI (Exams)
- (9) Ac A II, Ac A XI, Ac A VI, P&D II, EB X, EB XIV Sections
- (10) Content Management Section (to upload in the website)
- (11) Records Section
- (12) Stock File
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Forwarded / By Order

Section Officer

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Mrudula Menon V.
Mrudula Menon V.
Principal-in-Charge
The Cochin College