

GURU KASHI UNIVERSITY



Doctor of Philosophy

Session: 2025-26

**Department of Electronics and Communication
Engineering**

Faculty of Engineering and Technology

Program Structure										
S.No	Course Code	Course Title	Course Type	L	T	P	Credits	Internal	External	Total Marks
1	PPH101	Research Methodology	Core	4	0	0	4	30	70	100
2	PPH102	Research and Publication Ethics	Core	2	0	0	2	30	70	100
3	PPH104	Computer Applications in Research	Skill Based	0	0	4	2	30	70	100
4	PPH119	Advanced Computational Intelligence and Communication Systems	Core	4	0	0	4	30	70	100
Total							12	120	280	400

Course Title: Research Methodology

Course Code: PPH101

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

On the completion of the course the students will be able to

1. Formulate research problems by conducting comprehensive literature reviews utilizing web sources
2. Apply appropriate research design choices based on research questions and objectives.
3. Explore the integration of qualitative and quantitative data and the concept of triangulation and complementarity of data sources.
4. Utilize statistical software packages commonly used in research for importing, managing, cleaning, and analyzing data.
5. Apply different statistical techniques to summarize and analyze data effectively.

Course Content

Unit-I

15 Hours

Introduction to Research

Meaning, Objectives, Characteristics, Significance and Types of Research.

Understanding a Research Problem, Literature Review, Methods and Reporting, Selecting the Research Problem, Steps in Formulation of a Research Problem.

Unit-II

15 Hours

Research Process and Hypothesis

Constructing Hypotheses; Conceptualizing a Research Design-Meaning and Types of Research Design.

Parametric and Non-Parametric Test, Errors and Level of Significance.

Completely randomized design, Random block design, Latin square design, Statistical analysis.

Components of time series, Analysis of time series, Measurement of trend, Measurement of seasonal variations.

Unit-III

15 Hours

Sampling Design and Data Analysis

Sampling Techniques-Probability and Non-Probability, Qualities of a good Sample, Sample Size and its Determination.

Introduction to Qualitative, Quantitative and Mixed Methods, Quantitative Methods- Univariate, Bivariate and Multivariate, Qualitative Methods-Grounded Theory and Triangulations, Mixed Methods- Convergent Parallel, Explanatory Sequential, Exploratory Sequential and Transformative.

Implementation of statistical techniques using statistical packages viz. SPSS R including evaluation of statistical parameters and data interpretation, Regression Analysis, Covariance, analysis of variance.

Unit-IV

15 Hours

Report Writing

Types of Reports- technical and Popular Reports, Significance of Report Writing, Different Steps in Writing Report, Art of Writing Research Proposals, Research Papers, Projects Reports and Thesis; Basics of Citation and Bibliography/Reference Preparation Styles; Report Presentation: Oral and Poster Presentations of Research Reports.

Suggested Reading

1. Gupta, S. (2010). *Research Methodology and Statistical Techniques*. Deep & Deep Publications (P) Limited, New Delhi.

2. Kothari, C.R., Garg, G. (2019). *Research Methodology: Methods and Techniques*. 4th Edition, New Age International (p) Limited. New Delhi.
3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in Life Sciences*. Anmol Publications. New Delhi.
4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students*. Samfunds literature Publications.
5. Dharmapalan B. (2012). *Scientific Research Methodology*. Narosa Publishing

IOAC

Course Title: Research and Publication Ethics

Course Code: PPH102

L	T	P	Credits
2	0	0	2

Total Hours 30

Learning Outcomes

On the completion of the course the students will be able to

1. To have awareness about the publication ethics and publication misconducts.
2. To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor etc)
3. Develop hands-on skills to identify research misconduct and predatory publications.

Course Content

- **RPE 01: PHILOSOPHY AND ETHICS (3 Hrs.)**

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 (5 Hrs.)**

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

PRACTICE

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

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
- Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder,

Springer Journal Suggester, etc.

- **RPE 05: 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.)**

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

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

- A. Databases (4 hrs.)**

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

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

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

Suggested Readings

1. Bird, A. (2006). Philosophy of Science. Routledge.
2. MacIntyre, A. (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 Sciences, 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. Rensik, D. B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. <https://doi.org/10.1038/489179a>

Course Title: Computer Applications in Research

Course Code: PPH104

L	T	P	Credits
0	0	4	2

Total Hours 30

Learning Outcomes

On the completion of the course the students will be able to

1. The students will become familiar with the usage of software for managing the reference.
2. To make literature reviews easily.
3. To make reference management by using open software.

Unit I

06 Hours

MS Word Essentials-Create a document with styled headings and subheadings, Add headers, footers, and page numbers, Adjust page layout settings (margins, orientation, page size).

Table Creation and Management-Insert, format, and style tables, Adjust cell size, merge/split cells, and sort/filter data.

Working with Graphics-Insert and format images, shapes, SmartArt, and text boxes, Apply text wrapping around objects.

Unit II

08 Hours

Basics of PowerPoint- Slide layouts, themes, and templates, Adding multimedia: Images, audio, and videos.

Advanced Techniques- Animations and transitions for visual effects, Slide master for consistent formatting, Interactive elements: Hyperlinks and action buttons.

Design Best Practices- Typography, color schemes, and visual hierarchy, Tips for engaging presentations.

Unit III

08 Hours

Introduction to Mendeley- Installing and setting up Mendeley Desktop and Web, Importing references from various sources.

Organizing References- Creating folders and tagging references, Annotating and highlighting PDFs.

Citations and Bibliography- Integrating Mendeley with MS Word, using citation styles (APA, MLA, Chicago), Generating a bibliography automatically.

Unit IV

08 Hours

AI Tools for Productivity- Text-Based AI Tools (e.g., ChatGPT) Writing assistance, summarization, and brainstorming, Grammar and style checking, Image and Design Tools, Speech and Audio Tools

Suggested Readings

- 1) Office 2007 in Simple Steps, Kogent Solutions, (Wiley Publishers).
- 2) MS-Office 2007 Training Guide, S. Jain (BPB Publications).
- 3) Computer Fundamentals by P.K. Sinha (BPB Publications).
- 4) <https://www.mendeley.com/reference-management/reference-manager>
- 5) <https://chat.openai.com>
- 6) <https://edu.google.com/workspace-for-education/classroom/>

**Course Title: ADVANCED COMPUTATIONAL INTELLIGENCE
AND COMMUNICATION SYSTEMS**

Course Code: PPH119

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Integrate Computational Intelligence with Hardware Systems
2. Design and Analyze Intelligent Systems
3. Apply Communication System Principles
4. Evaluate Emerging Technologies

Course Content

UNIT-I: Neural Networks

15 Hours

Introduction-Biological Neurons and Memory, Structure and Function of Single Neuron, Artificial Neural Networks & its Training, Learning and Generalization. ANN Applications - Classification, Clustering, Pattern Recognition etc. Supervised Learning: Single-layer Networks, Mc Culloh- Pitts neuron model, Perceptron training and algorithm, Delta learning, Widrow- Hoff learning rules, limitations, Adaline and modification, Error Correction & Gradient Descent Rules. Multi-layer Networks: Architecture, BP Algorithm, Applications, RBF Network. Unsupervised Learning: Winner-takes all Networks, outstar learning, Counter propagation, SOMs-Kohonen. Neurodynamical Models: Hopfield Network, Bidirectional Associative Memories.

UNIT-II: Fuzzy Logic

15 Hours

Merits of Fuzzy system, Architecture of Fuzzy Systems, fuzzification, Rule Base, Inference Engine, defuzzification. Fuzzy Mathematics: Fuzzy sets, its properties and operations of fuzzy sets, fuzzy arithmetic, fuzzy relations. Applications to Fuzzy System Design.

UNIT-III: Antennas

15 Hours

Basic Antenna parameters, Radiation parameters, Antenna beam area, Antenna beam-width, radiation intensity, Antenna Gain, Directive Gain, Power Gain, Directivity, Antenna band-width, Radiation resistance, front to back ratio, Introduction to Monopole Antenna, Planar Antennas, Microstrip antenna, circular patch antenna, fractal antenna, dipole and folded dipole antenna, Yagi Uda antenna, antenna with parabolic reflector, helical antenna, horn antenna, slot antenna, and their application. Knowledge of antenna fabrication and their testing techniques, Different operating bands of WLAN, Digital Cellular System (DCS) and GPS antennas. IEEE/ITU communication standards and specifications, Application of 5G & 6G.

UNIT-IV: VLSI Technology and Design

15 Hours

Introduction to Monolithic Integrated Circuit technology, Bipolar & MOS IC, Film IC, Silicon Wafer Preparation & characterization, thermal oxidation, oxide thickness measurement, oxidation system, diffusion of dopants, diffusion equations, dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, ion implantation techniques, apparatus used, epitaxial growth of silicon, apparatus for epitaxy, photolithography techniques for pattern transfer, mask masking, photo resist & etching techniques, film deposition, vacuum deposition & sputtering apparatus, CVD processes and its applications in IC lab, metallization. Combinational & Sequential MOS logic circuits, design of standard cells for LSI, VLSI circuits, computer-aided design technology, semiconductor memories, DRAM, SRAM, Flash.

Suggested Readings

- Yegnanarayana, B. Artificial Neural Networks. PHI.
- Bart Kosko. Neural Networks and Fuzzy System. PHI.
- Prasad K D. Antenna & Wave Propagation. Satya Prakashan.
- Neil Weste. CMOS VLSI Design: A Circuits and Systems Perspective. David Harris-Pearson.