Pre-Ph.D. Course work in the subject of Electronics & Instrumentation Engineering

(Applicable to both, Full-time and Part-time PhD degree)

Paper-I: (Common to all candidates)

Department of Electronics and Instrumentation Engineering		
Paper I (RM-101): Research Methodology & Research Publication Ethics		
Part-I: Research Methodology:		
Unit	**Title**	**Topics**
1.	Fundamentals of Research and Types of Research	Research objectives, Scientific research, Importance of research methodology, Good Research Practices (GRP), Types of research and methods, surveys, case studies, Experiments and field studies, etc.
2.	Literature Review in Research	Basic Concept and its need, literature search, types of literature review, review of research, sources, synthesis process, planning of review and documentation.
3.	Research Design	Process, identification and Formulation of problem, Hypothesis, Tools of research
4.	Data analysis & interpretation	Editing, Coding, Transcription, Tabulation, Introduction to Analytical/Statistical software (SPSS or MINITAB or MATLAB) and presentation of data (Graphical)
5.	Statistical Analysis and Report writing	Measures of central tendency, dispersion and Association/Relationship, Variance, Regression and Correlation analysis, Hypothesis testing and Test of significance, Research paper and thesis writing
Part-II: Research Publication Ethics:		
6.	Research ethics and scientific conduct	Introduction to research philosophy and concept of research ethics, Ethical aspects in science and research, Intellectual honesty, research integrity, Scientific misconducts (Falsification, Fabrication, Plagiarism), Redundant publications (Duplicate, overlapping and Salami slicing), Selective reporting and misrepresentation of data.
7.	Publication ethics	Concept of publication ethics and its significance, Best practices and guidelines (COPE, WAME, etc.), Conflict of interest, Publication misconduct: Concept, problems and types Violation of publication ethics, authorship and contributor-ship. Identification of publication misconduct, complaints and appeals
8.	Predatory and open access publication	Predatory publishers and journals, Open access movement and publications, SHERPA/RoMEO tools to check copyright and self-archiving policies, Journal finder/Journal suggestion tools (JANE, EJF,SJS), Group discussion on publication misconduct
9.	Quality parameters and practices	Copy Rights and Intellectual Property Rights (IPR), Plagiarism Check: Software tools (TURNITIN, URKUND, etc.) practice Databases (Indexing, Citation) and Research Metrics: h-index, g-index, i-10 index, Impact factor, SNIP, SJR, IPP, Cite Score etc.

References:

1. Kothari, C.R. (2014) Research Methodology: Methods and Techniques, 2nd edn., New Age International Publishers, New Delhi.

2. Best, J. W. and Kahn, J. V. (2006) Research in Education, 10th edn., Pearson Publication, New Delhi.

3. Koul, L. (2019) Methodology of Educational Research, 5th edn., Vikas Publ., New Delhi (ISBN-9789353386368)

4. Garrett, H.E. (2005) Statistics in Psychology and Education, Paragon International Publishers, New Delhi

5. Kambadur, M., Ghosh, A. and Singhvi A. K. (2019) Ethics in Science Education, Research and Governance, Indian National Science Academy, New Delhi (ISBN: 978-81-939482-1-7)

6. Best Practice Guidelines on Publishing Ethics(2014), A Publisher's Perspective, 2nd edn., John Wiley & Sons, Ltd.

7. Chaddah, P. (2018) Ethics in Competitive Research: Do not get Scooped; Do not get Plagiarized, ISBN-978-9387480865

8. National Academy of Sciences, National Academy of Engineering and Institute of Medicine (2009) On Being a Scientist: A Guide to Responsible Conduct in Research, 3rd edn., National Academies Press.

9. Beall, J. (2012) Predatory Publishers Corrupting Open Access, Nature, 489(7415):179.

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

11. Software Manual SPSS/MINITAB/MATLAB

12. UGC syllabus for Research and Publication Ethics, D.O. no. F.1-1/2018 (Journal/CARE), Dec., 2019

Paper-II

Department of Electronics and Instrumentation Engineering

Advances in Electronics and Instrumentation Engineering	
Subject Code: EICWP-207;	**Credit:** 04

Unit	Title	Topics
1.	**Instrumentation system**	Introduction to Instruments and Their representation: Typical applications, Functional elements, Classification of instruments; static performance characteristics of instruments: Accuracy, precision, resolution, threshold, static sensitivity, linearity, Range and span, Hysteresis etc.
2.	**Soft computing techniques**	Introduction of Neural Network: Biological Neurons-structure of human brain, Characteristics of ANN, Artificial neurons, Activation functions, Training of ANN and different training algorithms. Fuzzy logic, Membership Function, Classical Vs Fuzzy sets and their Relations. Genetic Algorithms, optimization, Mutation and Crossover.
3.	**Microwave Engineering**	Microwaves: History and Application, Effect of Microwave on Human body, Microwave Spectrum and application Bands, Different Types of Antenna, Radiation mechanism, Fundamental parameters of Antennas, Far Field Parameter, Selection criterion of antenna on application basis, Microwave antennas for Industrial applications.
4.	**Linear Control Theory**	Review of matrix algebra, state variable modeling of continuous time systems, linearization of state equations, solution of state equations of linear time-invariant systems, Minimal realization of linear systems and canonical forms.
5.	**VLSI Interconnect Parameters and Modeling**	Interconnect Parameters-Capacitances, Resistance and Inductance; Electrical Wire Models - The Ideal wire, The Lumped Model, Lumped RC Model, The Distributed rc line, The Transmission Line; SPICE Wire Models-Distributed rc Lines in SPICE, Transmission Line Models in SPICE.

Text Books:

1. Instrumentation, Measurement and Analysis by BC Nakra and KK Chowdhary, 4/e, Tata Mc-Graw Hill Publishing Company Limited, 2017.
2. S.N. Sivanandam, S. N. Deepa, "Principles of Soft Computing", Second Edition, Wiley Publications.
3. Digital control & State variable methods conventional and neuro-fuzzy control system by M. Gopal TMH
4. C.A. Ballanis, "Antenna Theory, Analysis and Design", John Wiley & Sons, Third edition 2005.
5. Ramesh Garg, Prakash Bhartia, Inder Bahl and Apisak Ittipiboon, "Microstrip Antenna Design Handbook, Artech House, Boston London.
6. Rabaey, J.M, Chandrakasan, A. and Nikolic, B. (2009), Digital Integrated Circuits- A Design Perspective, 2nd Edition, PHI Learning Private Limited, New Delhi.