Syllabus of Pre-Ph.D. Course Work

In

Electronics & Communication Engineering

Department of Electronics & Communication Engineering

Faculty of Engineering & Technology
Gurukula Kangri (Deemed to be University),
Haridwar, Uttarakhand -249404

PROGRAM OUTCOMES

1. Knowledge of the most advanced research in the candidate's specialization area (Track) of Electronics & Communication Engineering, Antenna Theory, respectively.
2. In-depth understanding of academic theory and the preparation of high-quality research pertinent to the field of study.
3. Ability to select appropriate research methods and techniques suitable for the candidate's research field.
4. In-depth understanding of the current state of the art in the individual research area, and the ability to appropriately employ methods and existing research results in the development of new knowledge, theories, and presentation of research in the individual research area

Revised Syllabus (**Effective from the session 2021-22**)
Gurukula Kangri (Deemed to be University), Haridwar
Faculty of Engineering & Technology
Electronics & Communication Engineering

Pre Ph.D. Coursework

DSC/ SEC/ AECC	Subject	Periods			Evaluation Scheme				Total Marks	Credits
					Continuous Internal Assessment		CIA Total	ESE		
		L	T	P	CT	TA				
THEORY										
PET-C103	Research Methodology	3	1	0	20	10	30	70	100	6
PET-C104	Advances in Electronics & Communication Engineering	3	1	0	20	10	30	70	100	6
PET-C105	Research and Publication Ethics (RPE)	3	1	0	20	10	30	70	100	2
	TOTAL	9	3	0	60	30	90	210	300	14

PET-C 101 → Paper Code
→ 0, 5 & 6 stands for Theory, Practical & Seminar / Project respectively
→ Semester

Note:

1. **The course work can also be done from NPTEL / SWAYAM / MOOCs in relevant subject. The consent of guide is required for it. The certificate of course work is to be produced in the department.**
2. **Those who have already done course work from a recognized University / Institute, will be exempted from it.**
3. **Requirement of publications: Following requirements are to be fulfilled before submission of thesis.**
   - **(i) At least two research papers should be published in Scopus /UGC Care indexed journals, out of which at least one paper in scopus journal**
   - **(ii) One patent in the relevant field of research topic is desirable.**

L- LECTURE; T- TUTORIAL; P- PRACTICAL; CT-CUMULATIVE TEST; TA- TEACHER ASSESSMENT; ESE–ENDSEMESTER EXAMINATION

S.G. Compl.

PET-C103
RESEARCH METHODOLOGY

PREREQUISITE: NIL

OBJECTIVES:

- To produce a well-developed research proposal.
- To select an appropriate methodology with which to conduct the research and defend the methodology of their selection.
- To understand the various tasks required to carry out the research.
- To find the resources needed to perform the research process.
- Documentation of its findings in the individual research area.
- To understand of academic theory and the preparation of high-quality research pertinent to the field of study.
- Appropriately employ methods and existing research results in the development of new knowledge, theories and presentation of research in the individual research area.
- To learn the use of plagiarism tools.

COURSE OUTCOMES:

By the end of the course the students will be able to:

- Learn the concept of research, research process, types of research, research models and basics formats of report writing.
- Understand the basic concepts of philosophy and ethics.
- Apply publication and research ethics in their research work.
- Use of Internet in their research.
- Access the plagiarism tools.
- Write a research proposal in well format way.

PET-C103
RESEARCH METHODOLOGY

MM: 100
TIME: 3HR
L T P
3 1 0

SESSIONAL: 30
· ESE: 70
PASS MARKS: 55

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT-I

What is Research, Defining the Research Problem, Necessity and Techniques in defining the problem, Types of Research, Motivations in Research, Research Approaches, Research Methods v/s Methodology , Scientific method vs Arbitrary Methods, Deductive and Inductive Reasoning, Error Analysis and Accuracy, Descriptive Statistics, Probability, Random Variables, Sampling distribution and Probability Distribution, Hypothesis Testing, Regression Analysis, Multivariate Analysis, Testing of Hypothesis: Meaning, Basic concepts, Flow diagram, Power of a hypothesis test, Important parametric tests, Hypothesis Testing of Means, hypothesis testing of Correlation coefficients, Limitations of Tests of hypothesis.

UNIT-II

Significance of literature review, writing scientific report, structure and components of research report, revision, writing project proposal, writing a Research Paper, Citation counting and Impact factor, Science citation index (SCI)/ Science citation index Expended (SCI-E), H-index, Academic Ethics and Plagiarism, Intellectual Property Rights and Patent law.

Literature survey, Literature search technique using Google Scholar, Web of Science and Scopus, Methods of citation and referencing, Styles of referencing: APA, MLA, Oxford, Harvard, Chicago, Quality indices of research publication: Impact factor, H-index and other citation indices.

UNIT-III

Methods of Data Collection: Collection of Primary Data, Observation Method," Interview method, Collection of Data through questionnaire and Schedules, Other methods: Collection of Secondary Data, Selection of appropriate method for data collection, Case Study Methods, Guidelines for developing questionnaire, successful interviewing, Survey v/s experiment, Processing and Analysis of Data: Measures of Central Tendency, Dispersion, correlation and Regression, Chi- square test: Applications, Steps, characteristics, limitations, Analysis of Variance and Co-variance.

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UNIT-IV

Statistical Treatment of Analytical Data: Accuracy, Precision, expressing accuracy & precision, Standard deviation, Types of errors, Elimination & minimization of errors, Significant figures, Criterion for the rejection of data (Q test), Student's t-test, Method of least squares for drawing the best fit line.

UNIT-V

Research ethics, Institutional ethics committee, Issues related to Plagiarism, Avoidance of Plagiarism and Academic Integrity, Abiding University Rules.
Introduction to Latex, Installation of Latex, how to write application in Latex, how to write research paper in Latex, Use of Equations in Latex, Writing of Thesis in Latex.

SUGGESTED READINGS:

1. Kothari C.R., "Research Methodology: Methods and Trends", New Age International (P) Limited, Publishers, New Delhi.
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction ",Jute& Co, Ltd.
3. Kumar, "Research Methodology: A Step-by-Step Guide for Beginners", Pearson Education.
4. Dawson, C., "Practical Research Methods", UBSPD Pvt. Ltd.
5. Sharma, N. K., "Research Methodology", KSK Publishers, New Delhi.
6. Bird, A, "Philosophy of Science", Routledge.
7. Macintyre, Alasdair , "A Short History of Ethics", London.
8. Chaddah, P., "Ethics in Competitive Research: Do Not Get Scooped; Do Not Get Plagiarized", ISBN:9789387480865.
9. National Academy of Sciences, National Academy of Engineering and Institute of Medicine, "On Being a Scientist: A Guide to Responsible Conduct in Research", National Academies Press.
10. Resnik, D. B., "What is Ethics in Research & Why is it Important", National Institute of Environmental Health Sciences", 1—10.(https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfin)
11. Beall, J., "Predatory Publishers are Corrupting Open Access", Nature, 489(7415),179—179. (https://doi.org/10.1038/489179a)
12. Indian National Science Academy (INSA), "Ethics in Science Education, Research and Governance", ISBN:978-81-939482-1-7.(http://www.insaindia.res.in/pdf/Ethics_Book.pdf)
13. Levin, Richard I and Rubin, David (2007). Statistics for Management, Prentice Hall of India, New Delhi.
14. Levin, David M, Krehbiel, Timothy C, Bereson, Mark L., and Vishwanantham, P.K. (2011). Business Statistics, Prentice Hall of India, New Delhi.
15. Robert H. Carver,DOING DATA ANALYSIS WITH SPSS VERSION 18.0, Cengage Publisher.
16. Lokesh Jasari, Data Analysis Using SPSS, Sage Publication.
17. Rudra Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Oxford Publisher.

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PET-C104

ADVANCES IN ELECTRONICS & COMMUNICATION ENGINEERING

PREREQUISITE: Knowledge of Antenna Theory.

OBJECTIVES:

- To learn about the advancements and recent innovations in Electronics & Communication Engineering.
- To understand the concepts of Wireless & Broadband Communication
- To learn the applications of new technologies like MIMO, Massive MIMO Antennas.
- To understand the concepts of Nano Technology.
- To learn and evolve new dimensions of research and advancements.
- To develop a scientific, know how of the technologies and concepts that are being evolved in recent scenario.

COURSE OUTCOMES:

On completion of the course, student will be able to:

- Define the terms Broadband Communication
- Discuss the importance of Massive MIMO Antennas
- Will be familiar with the concepts of Nano Technology.

PET-C104

ADVANCES IN ELECTRONICS & COMMUNICATION ENGINEERING

MM: 100
TIME: 3HR
L T P
3 1 0

SESSIONAL: 30
ESE: 70
PASS MARKS: 55

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Antenna Principles: Current Elements, Radiation from Monopole & Half Wave Dipole. power radiated by current element, radiation resistance. Antenna Gain. Directivity. EffectiveArea. knowledge of antenna fabrication and their testing techniques in anechoic chamber.

UNIT II

Practical Antennas: Field of short dipole, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, Yagi-Uda array: Square corner yagi-uda hybrid circular polarization, Rhombic Antenna: Weight and Leg length, Parabolic Reflectors: Properties, Comparison with comer reflectors, Introduction to Metamaterial concept and metamaterial antenna, Fratal Antenna.

UNIT III

Wireless & Broadband Communication

IEEE/ITU communication standards and specifications, Wireless embedded approach, MIMO Antennas, Massive MIMO Antennas, Millimeter wave Communication, Application of 5G.

UNIT IV

Biomedical Engineering

Biomedical Signals, Biomedical System, Analysis, Implementation issues, Performance measures and types of antenna used for biomedical signals.

UNITV

Nano Technology

Present Devies and materials, Advances materials such as Carbon nano tubes etc., advance devices constraints, applications, Trade-offs. knowledge of waveguides in X, KU and KA bands and microstrip, and SIW waveguides.

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SUGGESTED READINGS:

1. **Constantine A. Balanis,** " Antenna Theory: Analysis and Design, 4th Edition", WILEY Publication.
2. **Joseph D. Bronzino,**" Biomedical Engineering Fundamentals" Taylor & Francis.
3. **Emil Björnson,** "Massive MIMO Networks: Spectral, Energy, and Hardware Efficiency"
4. **Lundstrom,**"Nanoscale Transistors Device Physics, Modeling and Simulation" Springer publisher.

PET-C105

Research and Publication Ethics (RPE)

PREREQUISITE: NIL

OBJECTIVES:

- To learn about the Philosophy and Ethics, Publication Ethics, Open Access Publishing and Publication Misconduct.
- To understand the concepts of h-index, g index, i10 index, altmetrics
- To learn the Best practices / standards setting initiatives and guidelines: like COPE. WAME.
- To understand the use of plagiarism software like Turnitin, Urkund and other open source software tools.

COURSE OUTCOMES:

On completion of the course, student will be able to:

- Define the terms Philosophy and Ethics
- Discuss the importance of Publication Misconduct
- Will be familiar with the concepts of Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, SpringerJournal Suggested, etc.

PET-C105

Research and Publication Ethics (RPE)

MM: 100
TIME: 3HR
L T P
3 1 0

SESSIONAL: 30
ESE: 70
PASS MARKS: 55

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

PHILOSOPHY AND ETHICS: Introduction to philosophy: definition, nature and scope, concept, branches, Ethics: definition, moral philosophy, nature of moral judgements and reactions.

UNIT –II

SCIENTIFIC CONDUCT: Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP), Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.

UNIT-III

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.

UNIT-IV

OPEN ACCESS PUBLISHING: Open access publications and initiatives, SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies, Software tool to identify predatory publications developed by SPPU, Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, SpringerJournal Suggester, etc.

UNIT-V

PUBLICATION MISCONDUCT:

A. Group Discussions

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

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

UNIT-VI

DATABASES AND RESEARCH METRICS:

A. Databases

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

B. Research Metrics

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

SUGGESTED READINGS:

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

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

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

4. National Academy of 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. Resnik, 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/research/resources/bioethics/whatis /index.cfrnBeall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. https://doi.org/10.1038/489179a

6. Indian National Science Academy (INSA), Ethics in Science Education, Research and Govemance(2019) ,ISBN:978-81-939482-l-7. httj>://www.insaindia.res.in/pdf/Ethics Book.pdf