Aliah University

Doctor of Philosophy (Ph.D.) Programme in Electrical Engineering

Departt. of Electrical Engineering
Aliah University
A-II/27, New Town
Kolkata-700160

A. Programme Outcomes (POs):

PO-1: Original research: Capability to solve an original research problem in the field and related field of Electrical Engineering.

PO-2: Knowledge: Ability to demonstrate fundamental and advanced-level knowledge in at least one broad area of Electrical Engineering disciplines for the purposes of conducting research.

PO-3: Solution of problems: Ability to develop innovative solutions to research problems.

PO-4: Utilization of computational and/or experimental skills: Competency to use experimental and computational skills to solve research problems.

PO-5: Usage of modern tools: Ability to apply appropriate modern engineering tools for modelling, analysing and solving the research problems.

PO-6: Ethics: Ability to recognize ethical concerns in academic veracity, use and citation of sources.

PO-7: Effective communication: Communicate research results in writing with peer-reviewed journals, conference proceedings etc. and orally with a broad audience.

B. Programme Specific Outcomes (PSOs)

PSO-1: To stimulate students for original and scholarly research contributions to the various fields comprising Electrical Engineering.

PSO-2: To encourage the students to spread their research careers beyond a doctoral degree, pursue careers in academics and industries.

PSO-3: To motivate the students to plan, solve and execute original research.

Course Structure of Ph. D. Course Work Department of Electrical Engineering Aliah University

Course Code	Course Title	Credit
PHD/RM-01	Research Methodology	**4**
PHD/RPE-02	Research and Publication Ethics	**2**
PHD/LR-03	Literature Review, Report and Seminar Presentation	**4**
PHD/SP-04	Subject Paper (….)	**4**
	Total Credit:	**14**

Subject Paper (PHD/SP-04) will be selected from the following list of subjects:

- Optimization Technique
- Optimal & Robust Control
- Advanced Digital Control
- Non-linear Control
- System Identification & Estimation
- Power Quality
- Computer Applications to Power System
- Power System Analysis & Control
- Advanced Power System Protection
- Principles of Industrial Instrumentation
- Modern Control Theory
- Advanced Digital Signal Processing
- Advanced Power Electronics
- Optimal & Robust Control
- Renewable Power Generation & Control
- Active Circuit & System

- Intelligent Control
- Numerical Methods
- Restructuring in Power System
- Modelling & Analysis of Electrical Machine
- Artificial Intelligence & Soft Computing
- Multi-Variable Control
- Model Predictive Control
- Power System Relaying
- Smart Grid & Metering
- Reactive Power Management
- Sensors & Devices
- Lighting Design & Calculations

Name of the Subject: **Research Methodology**
Subject Code: **PHD/RM-01**
Credit: **4**

Module No.	Topics
1	Introduction to Research Methodology: Meaning of Research, Objectives of research, Motivations in research, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Research Methods v/s Methodology, Research Process, Concept of applied and basic research process, Criteria of good research
2	Problem Identification & Formulation: Defining and formulating the research problem, Selecting the problem, Necessity of defining the problem, Importance of literature review in defining a problem, Identifying gap areas from literature and research database, Development of working hypothesis.
3	Techniques Involved in Solving Problem: Exact analytical solution of equations involved, Numerical solution of the equations, Simulating the problem on a computer, Experimental observations and theoretical modelling.
4	Data Collection and Analysis: Accepts of method validation, Observation and collection of data, Methods of data collection, Sampling methods, Data processing and analysis strategies and tools, Data analysis using Statistics, Hypothesis testing.
5	Writing Research Report: Format and style, Review of related literature its implications at various stages of research, Major findings, Conclusions and suggestions, Citation of references and Bibliograph
6	Intellectual property rights (IPR) - patents-copyrights-Trademarks-Industrial design geographical indication. Ethics of Research- Scientific Misconduct- Forms of Scientific Misconduct. Plagiarism, Unscientific practices in thesis work, Ethics in science.

Text Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
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. 270p.

Name of the Subject: **Research and Publication Ethics**
Subject Code: **PHD/RPE-02**
Credit: **2**

Module No.	Topics
1	Philosophy and Ethics: • Introduction to philosophy: definition, nature and scope, concept, branches. • Ethics: definition, moral philosophy, nature of moral judgements and reactions.
2	Scientific conduct: • Ethics with respect to science and research • Intellectual honesty and research integrity • Scientific misconducts: Falsification, Fabrication and Plagiarism • Redundant publications: Duplicate and overlapping publications, salami slicing • Selective reporting and misrepresentation of data
3	Publication Ethics: • Publication Ethics: Definition and importance • Best practices/ standards setting initiatives and guidelines: COPE, WAME etc. • Conflicts of interest • Publication misconduct: Definition, concept, problems that lead to unethical behaviour and vice versa, types • Violation of publication ethics, authorship and contributorship. • Identification of publication misconduct, complaints and appeals • Predatory publishers and journals

Text Books:

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: 3rd edition, National Academy Press.