

Bharati Vidyapeeth Deemed University

Faculty of Engineering and Technology

Revised Structure of Pre. Ph. D. coursework

Electrical Engineering

(with effect from Academic Year 2017-18)

Sr. No.	Subject	Teaching Scheme		Examination Scheme (marks)			Credits
		L	P/D	Theory Examination	Presentations	Total	
1	Paper –I: Research Methodology	4	-	100	-	100	04
2	Paper- II: Recent Advances in Electrical Engineering	4	-	100	-	100	04
3	Paper –III : i) Literature survey presentation ii) Presentation of idea of research *	-	02	---	50	50	02
		-	02	---	50	50	02
Total		08	04	200	100	300	12

Note: *- The student will have to give presentation based on the literature survey and idea of research and shall submit copy of the presentation to the respective Head of the Constituent Unit which is his/her place of research.

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FACULTY OF ENGINEERING AND TECHNOLOGY
Ph.D. Course-work Syllabus

Paper-I Research Methodology

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	Theory Examination: 100 Marks	Total Credits: 04
	Duration : 3Hrs	

Course Objectives:

- begin to formulate researchable problem in areas of research interest;
- write a research proposal or report;
- make appropriate choices about research strategies;
- review literature judiciously and systematically;
- understand and begin to apply the principles of collecting suitable data;
- understand and begin to conduct appropriate analyses of data;
- make appropriate choices about quantitative methods;
- demonstrate sensitivity to ethical issues raised by researchers;

Topics Covered

UNIT-I	Types and Characteristics of Research Definition and objectives of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Overview of research methodology in various areas of engineering, Introduction to problem solving, basic research terminology such as proof, hypothesis, lemma etc., Role of information and communication technology (ICT) in research.	(6 Hours)
UNIT-II	Review of Literature Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review Searching for publications: Publication databases, search engines and patent databases etc.	(6 Hours)
UNIT-III	Research Problem Formulation Research problem formulation, determine the scope, objectives, limitations and assumptions of the identified research problem, justify basis for assumption, developing the objectives Developing a research plan: Exploration, description, diagnosis and experimentation	(6 Hours)
UNIT-IV	Methods of Data Collection Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.	(6 Hours)
UNIT-V	Inferential Statistics and Hypothesis Testing Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing,	(6 Hours)

	generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.	
UNIT-VI	Quantitative Methods and Applied Statistics Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)	(6 Hours)
UNIT-VII	Computer Applications Role of computers in research, maintaining literature data using software tools such as Mendeley, Endnote2 etc., tabulation and graphical presentation of research data, use of statistical software tools such as Excel, R, SPSS, GRETL, MINITAB etc. in research, use of word processing tools such as Latex, software tools for making effective presentation.	(6 Hours)
UNIT-VIII	Developing Research Report: Structure and components of scientific reports, types of report, developing research report. Thesis Writing: Different steps and software tools in the design and preparation of thesis, layout, structure and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral Presentation: Creating and making effective presentation, use of visual aids, importance of effective communication.	(6 Hours)
UNIT-IX	Research Ethics and IPR Ethics: ethical issues in research, plagiarism tools and its importance. IPR: intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights.	(6 Hours)
UNIT-X	Publishing of research work Design of conference and journal research paper, design of review paper, effective way of writing abstract, introduction, result and discussion and conclusion in research papers, answering the queries of reviewers. Importance of publication in standard databases such as Scopus, Web of science etc., understanding of h-index, citation index and impact factor.	(6 Hours)
Text Books/References:		
1.	Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004	
2.	Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011.	
3.	C. R. Kothari ,Research Methodology: Methods and Trends, New Age International, 2004	
4.	S.D. Sharma , Operational Research, Kedar Nath Ram Nath & Co.,1972	
5.	B.L. Wadehra, Law relating to patents, trademarks, copyright designs and geographical indications, Universal Law Publishing, 2014.	
6.	Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005.	
7.	T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi.	
8.	A. Fink, Conducting Research Literature Reviews: from the internet to paper, Sage Publications, 2009	
9.	R. A. Day, How to write and publish a scientific paper, Cambridge University Press, 1992	

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Paper-II Recent advances in Electrical Engineering

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	Theory Examination: 100 Marks	Total credits: 04
	Duration : 3Hrs	

Topics covered

UNIT-I	Synchronous Machine Modeling: Formulation of State-Space Equation, Current Formulation, Per Unit Conversion, Normalizing Voltage equations, Normalizing Torque Equations, Torque & Power Equivalent Circuit of Synchronous Machine Load Modeling: Basic Load Modeling concepts, Static load representation, Dynamic load representation, Induction motor (as load) modeling, synchronous motor (as load) modeling, acquisition of load model parameters	(06 Hours)
UNIT-II	Dynamic modeling of three phase Induction Machine: Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-Equations in flux linkages-per unit model	(06 Hours)
UNIT-III	Vector control of Induction Motor: Principles of vector control, Direct vector control, derivation of indirect vector control, implementation – block diagram; estimation of flux, flux weakening operation	(06 Hours)
UNIT-IV	FACTS Shunt Compensators: Power Flow in AC system, Dynamic stability Considerations and the importance of the controllable parameters, Definitions on FACTS, Basic types of FACTS Controllers,. Static shunt Compensators :SVC and STATCOM Operation & characteristics and Control of TSC, TSR, STATCOM, Comparison between SVC and STATCOM – STATCOM for transient and dynamic stability enhancement.	(06 Hours)
UNIT-V	Series and Shunt- series Compensators: Static Series Compensation: GCSC, TSSC, TCSC and SSSC Operation and Control External system Control for series Compensator SSR and its damping – Static Voltage and Phase angle Regulators - TCVR and TCPAR –Operation and Control, The unified power flow Controller (UPFC)– Operation –control of P and Q – dynamic performance – s	(06 Hours)
UNIT-VI	PID Control: Review of classical and modern control concepts: PID control and tuning approaches, Selection of Variables for Control, PID Controller Tuning for Dynamic Performance - Determining Tuning Constants for Good Control Performance, Ziegler-Nichols method, Correlations for Tuning Constants, Fine-Tuning the Controller Tuning Constants, Controller tuning based on stability – Dead beat and self tuning, Rate feedback	(06 Hours)
UNIT-VII	Introduction to Advances in control system: Adaptive control , Model reference Adaptive control block diagram and working with practical applications, Fuzzy logic , Artificial neural network, algorithm and learning architecture Concept of robust control, Description and categorization of system uncertainties, System and signal norms, Small gain theorem, Robust stability, Design of robust control, Introduction to H-∞ control.	(06 Hours)

UNIT-VIII	Introduction to AMC, PIC peripherals : Introduction to PIC 16F8XX family and development tools. CPU architecture and instruction set. Harvard architecture and pipelining, program memory considerations, register file structure and addressing modes, CPU registers PIC peripherals I/O ports, external interrupts and timers, timer operation, ADC, short overview of synchronous serial port, serial peripheral interface I2C bus.	(06 Hours)
UNIT-IX	AMC Applications, ARM & AVR Processors: Learning MPLAB (V 5.0 or above) Integrated development environment from Microchip (Assembler and simulator), Study of applications like motor control, temperature control, lamp dimmer, 4X4 matrix keyboard and LCD interfacing etc. RISC, ARM design philosophy, ARM fundamentals, instruction set, thumb instruction set, exception & interrupt handling, efficient C programming, optimizing ARM assembly code, AVR architecture, instruction set, hardware interfacing, communication links and design issues.	(06 Hours)
UNIT-X	Power Quality Management in Smart Grid: Power Quality and Energy Management in Smart Grid, Power Quality Issues, Power Quality Conditioners for Smart Grid, Web Based Power Quality Monitoring, Power Quality Audit Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN), Bluetooth, Zig-Bee, GPS, Wi-Fi, Wi-Max Based Communication, Wireless Mesh Network, Basics of CLOUD Computing and Cyber Security for Smart Grid, Broadband Over Power line (BPL), IP Based Protocols	(06 Hours)

Text Books/References:

1.	R. Krishnan, "Electric Motor Drives - Modeling, Analysis & control", Pearson Publications, 1st edition, 02
2.	Dynamic simulation of Electric machinery using MATLAB / Simulink –Chee Mun Ong- Prentice Hall.
3.	Modern Power Electronics and AC Drives –B. K. Bose-Pearson Publications-
4.	Electric Motor Drives- R.Krishnan- Prentice Hall, Indian Edition.
5.	Power Electronics and Motor Control – Shepherd, Hulley, Liang – II Edition, Cambridge University Press
6.	N.GHingorani & L.Gyugyi " Understanding FACTS: Concepts and Technology of Flexible AC Transmission System" , IEEE Press, 2000
7.	K.R.Padiyar "FACTS Controller in power Transmission and Distribution" New Age Int Publisher, 2007
8.	Geir E. Dullered, F.G.Paganini - " A course in robust control theory "- Springer
9.	Jan Jan tzen- 'Foundation of Fuzzy control – a practical approach – Wiley
10.	Microchip PIC family Microcontroller handbook
11.	Design with PIC microcontrollers -John Peatman, Pearson Education Asia ,LPE
12.	Rajkamal, "Embedded system –architecture, programming and design", TMH Publication, edition 2003 4. David Simon, " An embedded software Primer", Pearson education , Asia
13.	Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, " Smart Grid: Technology and Applications", Wiley
14.	Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley Blackwell
15.	Peter S. Fox-Penner, "Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities"

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Paper III Subject: Review of literature on the Proposed research work

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2 Hours/Week	Presentation	Total credits: 04

Candidate may follow the guidelines mentioned below for completing the requirements of this course.

1	The student will have to give presentation based on the literature survey and shall submit copy of the presentation to the respective Head of the Constituent Unit which is his/her place of research.
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