Bharati Vidyapeeth Deemed University

Faculty of Engineering and Technology

Structure of Ph. D. Coursework

(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: Advances in Electronics Engineering	4	-	100	-	100	04
3	i) Literature survey presentation	-	02	--	50	50	02
	ii) Presentation of idea of research*	-	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 researchand shall submit copy of the presentation to the respective Head of the Constituent Unit which is his/her place of research.

BHARATI VIDYAPEETH DEEMED UNIVERSITY

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**	**(6 Hours)**
	Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.	
UNIT-VI	**Quantitative Methods and Applied Statistics**	**(6 Hours)**
	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)	
UNIT-VII	**Computer Applications**	**(6 Hours)**
	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.	
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, KedarNath 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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FACULTY OF ENGINEERING AND TECHNOLOGY
Ph.D. Course-work Syllabus

Paper-II
Advances in Electronics Engineering

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

Pre-requisite:
Knowledge of transforms like Fourier, Laplace and Z-transform, Numerical computational techniques using C/C ++, Micro-controllers, Semiconductor Theory, Terminology in Bio-Medical Engg, Power Electronics.

Course objectives:
This course will introduce the students to the recent trends in various domains of Electronics Engineering. By the end of the course, the student will be able to decide the major research area of his/her interest.

Course Outcomes:
At the end of course the student will be able to
- Identify the applications in the field of Bio-medical engineering and allied Electronics fields.
- Design systems based on Embedded and VLSI.
- Use alternative computational tools in the form of soft computing techniques.
- Identify various modes of electronic and data communication.

Topics covered		
UNIT-I	**Mathematical Modeling Techniques** Graph Theory, Probability models, Stochastic Processes Markov models, Log linear model, Optimization techniques (ILP, Max likelihood, SVD, Quadratric), Matrices based on order, Use of mathematical tools in engineering research like MATLAB/Scilab/Octave.	**(06 Hours)**
UNIT-II	**Image and Speech Processing** Image transforms, Image compression, Image segmentation, Color image processing, Motion picture analysis, Operations in speech such as enhancement, speech recognition, reorganization, Speech encoding, Frequency domain coders, Text to speech synthesis, Speaker identification.	**(06 Hours)**
UNIT-III	**Microwave and Antenna** Microwave components, amplifier design, plane waves at a media interface, waveguides, dielectric wave guide, radiation, arrays, propagation of radio waves, microwave antenna, antenna measurement,	**(06 Hours)**

	open ranges, Anechoic chamber, compact ranges, near field and far field measurements, computational electromagnetic methods.	
UNIT-IV	**Wireless Communication and Networks** Computer simulation of radio channels, Overview of 4G-LTE networks, IP switching and MPLS- Overview of IP over ATM and its evolution to IP switching, State of art of OFDM and MIMO, Optical communication networks- DWDM based network, Optical network on chip, Introduction to near field communication, LoRa communication.	**(06 Hours)**
UNIT-V	**Nano-electronic devices** Nanoscale MOSFET, Fin FETs, Vertical MOSFETs, Single Electron Transistors, Opto-electronics and Spintronic devices, Carbon nanotube based devices.	**(06 Hours)**
UNIT-VI	**Bio-medical Instrumentation, Bio-Signal and Bio-Image processing** Review of bio-electric signals, electrodes and sensors, invasive and non invasive techniques. Bio-Signal and Bio- Image processing and analysis techniques.	**(06 Hours)**
UNIT-VII	**Embedded Systems and Processors** Review of 32/64 bit processors , DSP processors, IoT enable processors (architecture, memory management, cache and core management, programming)	**(06 Hours)**
UNIT-VIII	**Artificial Neural Networks** Biological neuron, Artificial Neuron electrical model, neural networks as classifiers and linear regressor, concept of error energy, gradient descent algorithm, MLP with back propagation, RBF network training algorithm, Support vector machines, Convolutional Neural Networks, Deep learning techniques.	**(06 Hours)**
UNIT-IX	**Fuzzy Logic and Genetic Algorithms** Fuzzy Logic concepts, fuzzy sets, relation operators T-norm, T-conorm, Fuzzy Inference system (Mamdani, Sugeno, Tsukamoto), Genetic Algorithm, encoding techniques, genetic operations (Selection, Mating, Cross-over, Mutation), Fitness function, Introduction to genetic programming, introduction to rough sets.	**(06 Hours)**
UNIT-X	**Deep Submicron VLSI Design** Deep Submicron Transistor Models, Effect of Leakage, Deep Submicron Fabrication Technology, Design for Low Power, Silicon-on-Insulator Circuit Design.	**(06 Hours)**

Text Books/References:	
1.	R. S. Khandpur, Handbook of Biomedical Instrumentation, McGrawHills
2.	Frank Vahid and Tony Givargis, Embedded system design: unified hardware/software introduction, John Wiley & Sons, 2002
3.	Neil Weste, David Harris, CMOS VLSI Design: A circuit and system perspective, 4th edition, Person Publication.
4.	Myer Kutz, Standard Handbook of Biomedical Engineering Design, MGH
5.	Webster, Encyclopedia of Medical Devices and Instrumentation, Wiley Interscience
6.	Andrew Sloss, Dominic Symes, Chris Wright, ARM system developer's guide Designing and

	Optimizing System software, Morgan Kaufmann Publishers, 2010
7.	Douglass BP, Real time UML : Developing Efficient Objects for Embedded Systems, Addison Wesley, 2000
8.	Valvano JW, Embedded Microcomputer Systems Real Time Interfacing, Brooks/Cole, 2000
9.	Frank Vahid and Tony Givargis, Embedded system design: unified hardware/software introduction, John Wiley & Sons, 2002
10.	S K Mitra, Van Nostrand Reinhold, DSP: A computer- based approach, TMH
11.	John G Proakis and Dimitris. G. Manolakis, Digital Signal Processing, Prentice Hall of India, 1997
12.	Duda R.O. and Hart P.E., John, Pattern Classification and Scene Analysis, Wiley Interscience, 1973
13.	R.C. Gonzalez and P. Wintz, Digital Image Processing, Addison Wesley, 2nd Ed, 1987
14.	Rosenfeld and A. C. Kak, Digital Image Processing Academic Press, Vol-1, 1982
15.	Douglass BP, Real time UML: Developing Efficient Objects for Embedded Systems, Addison Wesley, 2000
16.	A. S. Tanenbaum, Computer Networks, PHI/PEA, 4th Ed, 2003
17.	Douglas Comer, DL Stevens, Internetworking with TCP/IP, Vol III, PEA, 2nd Ed, 1996
18.	Garg V, Joseph E. Wilkes, Wireless & Personal Communication Systems, Feher/Prentice Hall.
19.	Vijay Garg, Wireless communication and networking, Morgan Caufmann
20.	William Stallings, Wireless Communications and Networks, PHI
21.	Ram Murthy C. Siva, Gurusamy Mohan, Wdm Optical Networks: Concepts, Design and Algorithms, 2011, PHI Learning
22.	Theodore S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, 2002, Prentice Hall.
23.	Liao SY, Microwave Devices and Circuits, 1987, 2nd Ed, Prentice Hall of India
24.	Miligan TA, Modern Antenna Design, Jun 2005, 2nd Ed, McGraw Hill
25.	Gupta, Garg and Bahl, Microstrip Lines and slot Lines, 1979, Artech House
26.	Roddy Dennis, Microwave Technology, 1986, Reston Book Prentice Hall
27.	Stutzman WL and Thiele GA, Antenna Theory & Design, 1981, John Wiley & Sons
28.	Douglas Comer, DL Stevens, Internetworking with TCP/IP, Vol III, PEA, 2nd Ed, 1996
29.	Jochen Schiller, Mobile Communication, 2/e, PEA, 2003
30.	Abdlsalam A Helal et. al, Any Time Any Where Computing – Mobile Computing Concepts & Technology, Kluwer International Series in Engineering & Computer Science, 1999
31.	Neural Networks-A comprehensive foundation, Simon Haykin, Prentice Hall International Inc.,1999
32.	Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe , Neil R. Euliano , W. Curt Lefebvre ,John-Wiley & Sons, 2000
33.	Learning and Soft Computing-Support Vector Machines, Neural Networks, and Fuzzy Logic Models, Vojislav Kecman, The MIT Press,2001
34.	Fuzzy Logic With Engineering Applications, Third Edition, Timothy Ross, John Wiley & Sons,2010
35.	Ian Goodfellow, Deep Learning (Adaptive computation and Machine learning series),2016,MIT Press

36.	David Goldberg, Genetic Algorithm in search, Optimization and Machine Learning, 1989, Addison Wesley
37.	Riccardo Poli, A field Guide to Genetic Programming, 2008,http://www.gp-field-guide.org.uk/
38.	Mircea Dragoman, Daniela Dragoman, "Nano electronics: principles and devices, 2006, CRC Press