

**Scheme & Syllabi  
of  
Pre-Ph.D Course work  
in  
(Electronics & Communication Engineering)  
w.e.f. January 2012**



**Deptt. of Electronics & Communication Engineering  
Guru Jambheshwar University of Science & Technology  
Hisar (Haryana)-125001**

**Scheme & Syllabi of Pre-Ph.D Course Work  
in  
Electronics & Communication Engineering**

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**Pre-Ph.D Courses**

<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
PPD-101	Research Methodology	4	0	0	04
PPD-102	Review of Literature and Seminar (in Relevant Research area)	2	0	0	02
-	Departmental – Elective (in Relevant Research area)	4	0	0	04
<b>TOTAL CREDITS</b>					<b>10</b>

**Departmental Electives:**

<b>Code</b>	<b>Course Name</b>
PPD-103	Photonic Networks
PPD-104	Advanced Wireless Communication
PPD-105	Integrated Circuit Design

## PPD-101

# Research Methodology

**Max Marks: 100 (Credits: 04)**

**Assessment during Sem: 30 Marks**

**Assessment at the End of Sem: 70 Marks**

**L T P**

**04 - -**

**Nature & Scope of Research Methodology:** Problem formulation and statement of Research objectives, Organizational structure of research, research process.

**Research Designs:** Exploratory, Descriptive and Experimental Research design, Research Modeling: Types of Models, Simulation modeling, Methods of Data collection, Sample Design, Data analysis using suitable quantitative techniques with application of computers.

### **Computer Tools:**

Use of Tools like Microsoft Office, Microsoft Power Point for generating charts/ graphs, Equations, presentations, and other features. Web Search: Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, and advanced search techniques, Lab-work with relevant Simulation Software.

**Writing a research report:** Developing an outline, Key elements- Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference, writing of books and research papers, Report Writing- Prewriting considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals.

**NOTE:** Eight questions are to be set taking at-least one from each unit. Students have to attempt any five questions.

### **Books:**

1. Research Methodology: A Step by Step Guide for Beginners, 2/e, By: Ranjit Kumar, Pearson Education, 2005.
2. Research Methods in Education: An Introduction, 9/e, By: William Wiersma, Stephen G. Jurs, Pearson Education, 2009.
3. Exploring Research, 8<sup>th</sup> edition, by Neil J. Salkind, Pearson Inc. 2012.
4. Research Methodology By: Dr. Vijay Upagade, Dr. Arvind Shende, 2/e, S. Chand Group, 2012.
5. Research Methodology By: R. Cauvery, U.K. Sudhanayak, R.Meenakshi, S. Chand Group, 2010.

**PPD-102**  
**Review of Literature & Seminar**

**Max Marks: 100 (Credits: 02)**

**L T P**  
**02 - -**

The student will be required to do the review of literature work (ranging between 20-30 papers) under the guidance of the senior faculty member(s) / supervisor concerned and to present their work in the form of seminar before the committee constituted by Dean, FET for evaluation.

**PPD-103**  
**Departmental Elective for Ph.D (ECE)**

**PHOTONIC NETWORKS**

**Max Marks: 100 (Credits: 04)**

**Assessment during Sem: 30 Marks**

**Assessment at the End of Sem: 70 Marks**

**L T P**

**04 - -**

**Unit-I**

Introduction: Introduction to basic optical communication & devices, WDM optical Network evolution.

**Unit-II**

Optical Multiplexing Techniques: Wavelength Division multiplexing, Time division multiplexing & code division multiplexing.

**Unit-III**

Optical Networks: Why optical networks? Conventional optical networks, SONET/SDH, FDDI, Multiple access optical networks, WDM optical networks architectures and issues in wavelength routed networks, optical LAN.

**Unit-IV**

All Optical Networks: Amplification in all optical networks, All optical subscriber access networks, Design issues.

**Unit-V**

Optical Switching & Routing: Optical switching, example of an optical switch using 2 x 2 coupler, evolution of switching technologies, switching architectures, Micro Electro Mechanical Systems (MEMS), optical routers, wavelength converters, Add drop multiplexers with & without wavelength conversions.

**Note:** The examiner is required to set EIGHT questions in all carrying equal marks covering the entire syllabus. The candidate is required to attempt FIVE questions.

**Recommended Books:**

- Uyles Black, 'Optical Networks', Pearson Education, 2008
- D.K. Mynbaeu & L. Scheiner, 'Fiber Optic Communication Technology', Pearson Edu. Asia, 2008
- C. Siva Ram Murthy & M. Gurusamy, 'WDM Optical Networks' Pearson Education, 2009
- RG Gallager & D Bertsekas, 'Data Networks', PHI, 2006

**PPD-104**  
**Departmental Elective for Ph.D (ECE)**

**ADVANCED WIRELESS COMMUNICATION**

**Max Marks: 100 (Credits: 04)**

**Assessment during Sem: 30 Marks**

**Assessment at the End of Sem: 70 Marks**

**L T P**

**04 - -**

**Overview of Wireless Communication Systems:** Various Generations 1-G, 2-G, 3-G, 4-G and LTE, Concept of Cell, Hand-off, Interference, Capacity improvement of cellular system, Overview of GSM, GPRS, WCDMA, Wi-Fi, WiMax, Bluetooth technology.

**Fading in Mobile Radio:** Introduction to multipath fading, fading parameters, Types of fading and their effects, statistical models of multipath fading channels.

**Modulation Techniques for Mobile Radio:** Transceiver structures of BPSK, QPSK, O-QPSK, pi/4 QPSK, QAM, MSK, GMSK and their performance in multipath channels.

**Channel Coding and Decoding:** Basics of Channel coding, Block Codes, Convolutional Codes, Turbo codes, etc, Coding Gain.

**Diversity, Equalization and Multi-user Detection Techniques**

**Spread Spectrum and CDMA:** Spread spectrum concept, DS, FH and TH Spread Spectrum, Capacity of Cellular CDMA, Orthogonal & Non-orthogonal Spreading sequences and their generating structures and correlation functions, RAKE receiver, MC-CDMA, Implementation issues in multicarrier modulation.

**NOTE:** Eight questions are to be set taking at-least one from each unit. Students have to attempt any five questions.

**Text Books:**

1. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996
3. Wireless Communication; Principles and Practice; T.S.Rappaport, PHI, 2002
4. OFDM and MC-CDMA : L. Hanzo, Wiley Pub. 2008.

**PPD-105**  
**Departmental Elective for Ph.D (ECE)**

## **INTEGRATED CIRCUIT DESIGN**

**Max Marks: 100 (Credits: 04)**

**Assessment during Sem: 30 Marks**

**Assessment at the End of Sem: 70 Marks**

**L T P**

**04 - -**

### **Unit-I**

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. Device & Technology Impact on Low Power, Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

### **Unit-II**

Power estimation: Simulation Power analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation, Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

### **Unit-III**

Low Power Design: Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

### **Unit-IV**

Operational Amplifier: Applications of operational Amplifier, theory and Design; Definition of Performance Characteristics; Design of two stage MOS Operational Amplifier, two stage MOS operational Amplifier with cascodes, MOS telescopic-cascode operational amplifiers, MOS Folded-cascode operational amplifiers, Bipolar operational amplifiers.

### **Unit-V**

Nonlinear Analog Circuits: Voltage controlled oscillator, Comparators, Analog Buffers, Source Follower and Other Structures. Phase Locked Techniques; Phase Locked Loops (PLL), closed loop analysis of PLL. Digital-to-Analog (D/A) and Analog-to-Digital (A/D) Converters.

OTA & Switched Capacitor filters: OTA Amplifiers, Switched Capacitor Circuits and Switched Capacitor Filters.

**Note:** The examiner is required to set EIGHT questions in all carrying equal marks covering the entire syllabus. The candidate is required to attempt FIVE questions.

#### **Recommended Books:**

- Gary K. Yeap, Practical Low Power Digital VLSI Design, KAP, 2002
- Rabaey, Pedram, Low power design methodologies Kluwer Academic, 1997
- Kaushik Roy, Sharat Prasad, Low-Power CMOS VLSI Circuit Design Wiley, 2000
- D. A. Johns and Martin, Analog Integrated Circuit Design, John Wiley, 1997.
- R Gregorian and G C Temes, Analog MOS Integrated Circuits for Signal Processing, John Wiley, 1986.
- Behzad Razavi, "Principles of data conversion system design", S.Chand and company Ltd, 2000. John Wiley
- Kenneth R. Laker, Willy M.C. Sensen, " Design of Analog Integrated ckts and sys", McGraw Hill, 1994.