PG Department of Electronics and Instrumentation Technology

University of Kashmir, Srinagar

Course Structure & Syllabus for Integrated Ph. D. Programme

Course Structure

Course Code	Course Name	Maximum Marks	Min Pass %age
ELE-IPHD-01	Recent Advances in the Subject	100	50%
ELE-IPHD-02	Methodology	100	50%
ELE-IPHD-03	Specialized Paper	100	50%

Detailed Syllabus – Paper I

Course Title: – Recent Advances in the Subject **Course Code: – ELE-IPHD-01**

Duration of Examination: – 3 Hours **Maximum Marks: – 100**

Note: *The question paper shall comprise of two (02) questions (each of 25 marks) from each unit. A candidate has to attempt four question from four different units from a single section of his/her choice in 3 Hours duration.*

SECTION A

Unit 1: Microelectronics and VLSI
Microelectronic devices, characteristics, mathematical modelling, performance parameters, design aspects, parasitic, integration issues, layout rules, optimization techniques.

Unit 2: Beyond CMOS VLSI (Evaluation criteria and challenges)
Evolutionary advances beyond CMOS (Multiple-gate FET, SOI MOSFET)
Evaluation criteria: Scalability, performance, energy efficiency, on/off ratio for memory devices, gain for logic devices, CMOS technology compatibility and CMOS architectural compatibility.
Challenges: operational reliability, interconnects, fabrication defects, Analog and digital co-design

Unit 3: Recent applications and developments in VLSI
High-performance logic circuits, flexible electronic circuits, nanoscale integrated circuits, low power and dense memory devices, High performance integrated circuit design for fractional-order systems.
Conventional vs. tactile computing, molecular and biological computing, Mole electronics- molecular diode and diode-diode logic, Defect/fault tolerant computing.

Unit 4: RFIC Design
RF Amplifiers, characteristics, mathematical models, power relations, stability considerations, stability circles, unconditional stability, stabilization methods, designs, circles, circles.

Unit 5: Nano Technology
Present devices and materials, Advance materials such as Carbon nano tubes etc., advance devices as Single Electron Transistor etc., constraints, applications, Trade-offs.

Unit 6: Mixed Signal Analysis
Signal integrity, techniques, equivalent models, characteristics, limitations, mixed signal processing, simulation, physical parameters.

SECTION B

Unit 1: RF Systems
The techniques of RF amplifier, mixer and local oscillator designs, Advanced YIG and narrow band filters, amplifiers, Transmission line design, Design challenges in satellite frequency bands.

Unit 2: Microwave and Antennae
Microwave sources, Passive devices, MMIC, MMIC fabrication techniques, Thick and Thin film technologies and materials, Micro strips, Microwave antennae.

Unit 3: Coding and Modulation Techniques in Communication
Digital communication system architectures, Source coding, Channel coding, Performance measures of communication systems, Hamming and Reed Solmon coding techniques.

Unit 4: Mathematical theory of Wireless Communication Systems.
Baseband receiver for ISI mitigation, Physical modelling of wireless channels, statistical channel models, fading-outage probability, average probability of error, Modelling of semi path-loss channels models.

Unit 5: Wireless & Broadband Communication
IEEE/ITU/ ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae and front end design issues.

Unit 6: Wireless Networks
Cellular standards, Migration and advancement of GSM and CDMA architectures, Emerging WLAN standards, Various IEEE Standards, Trade-offs in functionality and implementations.

SECTION C

Unit 1: Advanced Topics in Signal Processing
Modelling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various applications.

Unit 2: Image Processing & Biometrics
Image representation formats, Noise Processing Techniques, Performance Measurements, Two dimensional orthogonal and unitary transform, DCT, DFT, DWT- properties and uses. K-L transform, Arnold Transform, Biometrics, Use of Biometrics for authentication and security.

Unit 3: Speech Processing
Speech recognition and synthesis techniques, modelling the speech signal, various algorithms, trade-offs and implementation issues.

Unit 4: Programmable Architectures and Memories
VHDL programming, PLDs, floating point arithmetic, multipliers, modelling a sequential machine, FPGA design flow, FPGA Architectures, Interconnect Technology.

Unit 5: Multimedia Compression
Various Compression Standards: JPEG & JPEG 2000, Quantization Matrix and Quality Factor, Wavelet Families and Wavelet Coding, Lempel-ziv coding, Run length Coding, Qualitative and Quantitative performance measurements.

Unit 6: Non-Linear Dynamics and Chaotic Theory
Chaos, Chaotic Models, Strange Attractors, Autonomous Dissipative Systems, Logistic Maps and their properties, Poincare Sections, Bifurcation and Invariant Density function plots, Largest Layopunov exponent, Fractals, Fractal Image Compression

SECTION D

Unit 1: Processor Architectures
Design philosophy of RISC, CISC, Multi-core, Parallelism, Pipelining, Various processor architectures, Design of microcontroller CPU.

Unit 2: Programming
Procedural and Object-Oriented paradigm, Inheritance, Object, Class, Encapsulation, Message Passing, Polymorphism, Abstraction, Method Overloading and Overriding Advanced trends: Generic functions, Class Templates, Singleton Classes. Low Level Programming.

Unit 3: Network Security
Network Threats, Attacks and Security Services, Security Protocols, Elliptic Curve Cryptography, Public and Private Key, Digital Signatures, Public Key Infrastructure.

Unit 4: Data Structures
Data structure operations; Stacks; Arrays; Queues; Linked list; Binary search tree (BST); AVL trees; searching and sorting algorithms.

Unit 5: Advanced Database Management Systems
Distributed DBMS Architecture-Client-Server systems, Collaborating Server System, and middleware system, Storing data in DDBMS-Fragmentation and replication.
Unit 6: Embedded Systems
Embedded system project development, Design issues and co-design issues in system development process, The Embedded Design Life Cycle, Embedded OS - Tasks, Processes and Threading, Multi-processes and Multithreading, Process Management, Embedded system security requirements and issues.

Reference Books:

1. Bernd Hoefflinger, "Chips 2020, A guide to the future of nanoelectronics", Springer publication.
2. Kevin F. Brrnnan, "Introduction to semi-conductor device", Cambridge publications.
3. Eugene D. Fabricius, "Introduction to VLSi design", McGraw-Hill International publications.
4. The International Technology Roadmap for semiconductors (ITRS)
5. M.J. Roberts, "Signals and Systems", Tata McGraw Hill Publications, 2003.
6. M. Burns, "Introduction to Mixed Signal IC Test and Measurement", Oxford University Press Publications, New York.
7. Yedidyah, Langsain and Teanenbuam, "Data Structures Using C and C++", 2nd Edition
8. Xilinx, "The Programmable Logic Data Book", Xilinx, California.
9. Hu, Yu Hen, "Handbook of Neural Network Signal Processing", CRC Press Publications.
10. Yacoub M.D., "Wireless Technology", CRC Press Publications.
11. Gold B., "Speech and Audio Signal Processing", John Wiley Publications.
12. Kuo B.C., "Digital Control System", Sounders College Publications, New York.
13. Comer "Digital Logic and State Machine Design", Sounders College Publications, New York.
14. Prokis J.G., "Digital Signal Processing", PHI Publications.
15. Alley, Charles L, "Micro Electronics", McGraw Hill Publications.
16. Ha, Tri T., "Digital Satellite Communication", McGraw Hill Publications.
17. Peebles, "Probability and Random Signals", McGraw Hill Publications.
18. Balanis, "Antenna Theory analysis and Design", John Wiley Publications.
19. Gray R.P.," Analysis and Design of Analog ICs", John Wiley Publications.
20. Tompkins J.W., "Biomedical Digital Signal Processors", PHI Publications.
21. Ramez Elmsari and Shankant B. Navathe, "Fundamentals of Databases Systems", Pearson, 2nd Edition.
22. Collin E.R., "Foundations for Microwave Engineering", McGraw Hill Publications.
23. Freeman R.L., "Radio System Design for Telecommunication", John Wiley Publications.
24. Kronsjo L., "Advances in Parallel Algorithm", Blackwell Scientific Publication, London.
25. Maureen, Sprankle and Tim Habbard, "Programing and Problem Solving Concepts", PHI.
26. Xavier, Eugune S.P., "Statistical Theory of Communication", New Age International Publication.
27. Baker R.J., "CMOS: Circuit Design, Layout and Simulation", IEEE Press Publication.
28. McGillen C.D., "Continuous and Discrete Signal and System Analysis", Oxford University Press.
29. Russ J.C., "The Image Processing Handbook", CRC Press Publications.
30. Franssila S., "Introduction to Micro fabrication", John Wiley Publications.
31. Park J., "Practical Embedded Controllers", Elsevier Publications, Amsterdam.
32. Kabatiansky G., "Error Correcting Coding and Security for Data Network", John Wiley Publications.
33. Lee K., "Semiconductor Device Modeling For VLSI", PHI Publications.
34. Maxfield C.M., "The Design Warriors Guide to FPGA", Elsevier Publications, Amsterdam.
35. Algorithms and Applications", Wiley-VCH, Weinheim Publications.
36. Simon Haykin, "Neural networks and learning machines", 3rd Edition, PHI publication.
37. Strogatz and Dichter, "Non-Linear Dynamics and Choas", 2nd Edition, Westveiw press.

Detailed Syllabus – Paper II

Course Title: – Methodology **Course Code: – ELE-IPHD-02**

Duration of Examination: – 3 Hours **Maximum Marks: – 100**

Note: *The question paper shall comprise of 8 questions (two questions from each unit) of 25 marks each. A candidate has to attempt one question from each unit in 3 Hours duration.*

Unit-1

Research Methodology: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Methods.

Defining the Problem: What is research problem? Selecting the Problem, Necessity of defining the Problem, Techniques involved in Defining a Problem.

Unit -2

Research Design: Meaning of Research Design, need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs.

Literature Survey and Presentation of Results: Reference, Awareness of current status, Possible ways of updating Internet and its applications, Email, WWW – Web browsing, Assessing the status of problem, Guidance from the supervisor, Actual investigation, Presentation of data, Symbols, Results and Conclusion, Presenting a scientific paper in a seminar, Thesis writing.

Unit -3

Numerical Methods and Techniques: Solution of Algebraic and transcendental equation (Bisection Methods, Iteration Methods and its Convergence, Methods of False Position, Newton-Raphson Method).

Numerical Integration and Differentiation: Simpson's 1/3 Rule, Simpson's 3/8 Rule, Solution of Differential equations, Euler and Runga-Kutta Methods.

Unit -4

Statistical Techniques: Definition and genesis of Binomial, Random Variables, Probability Density Function, Normal Distribution, Binomial & Poisson Distribution, Gamma(2-Parameter), Moments and Moment generating functions, Methods of moments, Expected value and estimation of Mean & Variance, Maximum likelihood estimation (MLE) method and their properties. Introduction to Finite Element Method (FEM).

References:

1. A handbook of Methodology of Research by P. A. Rajammal
2. Numerical Methods by E. Balagruswamy.
3. Mathematical Statistics by S. P. Gupta
4. Introduction to Finite Element Method by J.N. Reddy

Detailed Syllabus – Paper III

Course Title: – Specialized Paper **Course Code: – ELE-IPHD-03**

Duration of Examination: – 3 Hours **Maximum Marks: – 100**

Notes:

1. *The question paper shall comprise of 8 questions (two questions from each unit) of 25 marks each. A candidate has to attempt one question from each unit in 3 Hours duration.*
2. *The syllabus of this paper shall be unique to a particular scholar which shall be devised by the supervisor and get approved by the DRC.*

M. Tech. in Embedded Systems and Solutions

Name of the Programme:

M. Tech. in **Embedded Systems and Solutions** at *Department of Electronics and Instrumentation Technology, Main Campus, University of Kashmir*, Srinagar.

Introduction:

Embedded Systems are application specific electronic sub-systems which are completely encapsulated by the main system it belongs to. The main system can range from household appliances, home automation, consumer electronics, ATMs, network routers, automobiles, aircrafts, IoT, etc. The M. Tech. programme in Embedded Systems and Solution (ESS) has been introduced in the Department to foster growth and entrepreneurship in Electronics System Design and Manufacturing (ESDM) and to help meet growing demand of highly skilled manpower in various domains of Embedded System Design which is essential to support Electronics System Design and Manufacturing (ESDM), a much sort-after destination as endorsed in National Policy on Electronics by the Govt. of India.

Duration:

Regular **TWO** Years (**FOUR** Semesters) Degree Programme.

Eligibility:

B.E./B. Tech./B.Sc. Engineering in Electrical Sciences (Electronics, Electrical, Instrumentation, Communications, Computer Sciences), M. Sc. Electronics, M. Sc. Information Technology, M. Sc. Computer Sciences, MCA with 55% marks for general category and 50% marks for reserved categories in the qualifying examination from this University or from any other university as equivalent thereto by this University.

Mode of Selection:

Selection of candidates to the programme shall be made on the basis of a valid **GATE Score**.

Intake Capacity:

TWENTY-ONE (20) (for academic Year 2016-2017) to be filled up from Open Merit and Reserved Categories as per the University Admission Policy.

Course Fee:

Total Fees: **Rs. 1,46,750/=** (**Part A:** Rs. 10,000/= per year; **Part B:** Rs. 31,250/= per semester; **Part C:** Rs. 1,750/= per year)

Course Structure:

The M. Tech. programme in Embedded Systems and Solutions (**ESS**) is a four semester programme. The first three semesters of the programme comprise of academic course work. During the fourth semester, a student has to take up an industry internship, or pursue academic research in the Department leading to M. Tech. thesis (*no grouping is permitted*). The programme also includes a unique 4-week period at the beginning of the programme called a "**Preparatory Term**". The preparatory term in intended to bring all the incoming students up to a uniform background that is considered essential to embark on M. Tech. degree in Embedded Systems and Solutions. This *Preparatory Term* covers a programming course and a course on electronic circuits and systems. After the 4-week preparatory term, the first semester of the M. Tech. programme consists of foundational courses in Embedded Systems that include the fundamentals of embedded systems, microcontrollers, digital system design and wireless communication and networks. The second semester includes an 8-week period called the "**Winter Term**" which is intended to build foundation of research aptitude and presentation skills in the students. In this term the students through self-study will learn various research methodologies and prepare seminar presentation on some contemporary topic in electronic system design. The second and third semesters includes advanced topics in embedded system design that include embedded programming languages, system design with ARM Cortex microcontrollers, VLSI architecture and design methodologies, digital signal processor and architecture and internet of things. Students shall have to choose four elective courses in their area of interest and specialization. The final semester is designated for industry **Internship** or a research **Thesis**.

Semester – I (JUL – DEC)

Term	Course Code	Course Title	Hours			Credits	Marks		
			Lecture	Tutorial	Practical		Internal	End Term	Total
Semester I ***Preparatory Term*** (JULY)	ESS-101P	Principles of Electronic Circuits, Systems and Devices	4	2	8	0	100	50	150
	ESS-102P	Programming and Problem Solving Techniques	4	2	8	0	100	50	150
Semester – I (Preparatory Term) Pass/Fail Nature. *No credits/marks (marks shown are only for evaluation purpose)*			*8*	*4*	*16*	*0*	*200*	*100*	*300*
Semester I ***Course Work*** (AUG – DEC)	ESS-103C	Fundamentals of Embedded Systems	3	1	0	4	50	100	150
	ESS-104C	Microcontrollers for Embedded System Design	3	1	0	4	50	100	150
	ESS-105C	Advanced Digital System Design	3	1	0	4	50	100	150
	ESS-106C	Wireless Communication and Networks	3	1	0	4	50	100	150
	ESS-107L	Embedded System Design Lab	0	1	6	4	70	80	150
	ESS-108L	Advanced Digital System Design and Wireless Communication Lab	0	1	6	4	70	80	150
Semester – I (Course Work) Total			**12**	**6**	**12**	**24**	**340**	**560**	**900**

Semester – II (JAN – JUN)

Term	Course Code	Course Title	Hours: Lecture	Hours: Tutorial	Hours: Practical	Credits	Marks: Internal	Marks: End Term	Marks: Total
Semester II ***Winter Term*** *(JAN-FEB)*	ESS-201R	Research Methodology (Self Study)	0	0	0	2	25	50	75
	ESS-202S	Seminar	0	0	0	2	75	0	75
Semester – II (Winter Term) Total			**0**	**0**	**0**	**4**	**100**	**50**	**150**
Semester II ***Course Work*** *(MAR – JUN)*	ESS-203C	Advanced Embedded Programming Languages	3	1	0	4	50	100	150
	ESS-204C	CPLD and FPGA Architectures	3	1	0	4	50	100	150
	ESS-205C	Embedded System Design with ARM Cortex Microcontrollers	3	1	0	4	50	100	150
	ESS-206	*Elective – 1*							
	ESS-206E1	Statistical Signal Processing	3	1	0	4	50	100	150
	ESS-206E2	Sensors and Actuators							
	ESS-206E3	System on Chip Architecture							
	ESS-206E4	Multimedia and Signal Coding							
	ESS-207L	ARM Cortex Microcontroller Lab	0	1	6	4	70	80	150
	ESS-208L	CPLD and FPGA Lab	0	1	6	4	70	80	150
Semester – II (Course Work) Total			**12**	**6**	**12**	**28**	**440**	**610**	**1050**

Semester – III (JUL – DEC)

Term	Course Code	Course Title	Hours: Lecture	Hours: Tutorial	Hours: Practical	Credits	Marks: Internal	Marks: End Term	Marks: Total
Semester III ***Course Work*** *(JUL – DEC)*	ESS-301C	Digital Signal Processor and Architecture	3	1	0	4	50	100	150
	ESS-302C	Mixed Signal Embedded Systems	3	1	0	4	50	100	150
		Elective – 2							
	ESS-303E1	Embedded System Security and Forensics	3	1	0	4	50	100	150
	ESS-303E2	Network on Chip							
	ESS-303E3	Adhoc and Wireless Sensor Networks							
	ESS-303E4	Embedded Networks and Protocols							
	ESS-304	*Elective – 3*							
	ESS-304E1	Internet of Things	3	1	0	4	50	100	150
	ESS-304E2	RF Microelectronics							
	ESS-304E3	Industrial Robotics							
		Elective – 4							
	ESS-305E1	Soft Computing Techniques	3	1	0	4	50	100	150
	ESS-305E2	Digital Communication Techniques							
	ESS-305E3	Automotive Embedded Electronics							
	ESS-305E4	RF Engineering							
	ESS-306L	Mixed Signal and DSP Systems Lab	0	1	6	4	70	80	150
	ESS-307P/I	Pre Project/Pre-Internship	0	1	6	4	70	80	150
Semester – III (Course Work) Total			**15**	**7**	**12**	**28**	**390**	**660**	**1050**

Semester – IV (JAN – JUN)

Term	Course Code	Course Title	Hours			Credits	Marks		
			Lecture	Tutorial	Practical		Internal	End Term	Total
Semester IV ***Internship*** *(JAN – JUN)*	ESS-401I	Internship	0	0	48	24	900	0	900
Semester IV ***Thesis*** *(JAN – JUN)*	ESS-401T	Project and Thesis	0	0	48	24	200	700	900
Semester – IV (Internship/Thesis) Total			**0**	**0**	**48**	**24**	**900/ 200**	**0/ 700**	**900**

Examinations:

Semester – I:

a) **Preparatory Term Examination: on 1st and 2nd working days of August;** Students who do not qualify the Preparatory Term shall have to qualify it before appearing in Course work examination of 1st semester. This term is of **Pass/Fail Nature and therefore, students will not secure any credit or marks in this term.**

b) **Course Work Examination: Commences in 2nd Week of December.**

Semester – II:

a) **Winter Term Examination: 1st Week of March;** Students who do not qualify the Winter Term shall have to qualify it before appearing in Course work examination of 2nd semester.

b) **Course Work Examination: Commences in 2nd Week of June.**

Semester – III:

a) **Course Work Examination: Commences in 2nd Week of December.**

Semester – IV:

a) **Internship and Thesis Examination: Commences in 2nd Week of July.**

Assessment and Grades:

Percentage of Marks Secured	Letter Grade	Grade Points
80% and above (≥80% but ≤100%)	**O** (Outstanding)	10
Below 80% but not less than 70% (≥70 % but < 80%)	**A+** (Excellent)	9
Below 70% but not less than 60% (≥60% but <70%)	**A** (Very Good)	8
Below 60% but not less than 55% (≥55% but <60%)	**B+** (Good)	7
Below 55% but not less than 50% (≥50% but <55%)	**B** (Above Average)	6
Below 50% (<50%)	**F** (FAIL)	0
ABSENT	**AB** (Absent)	0

Preparatory Term Courses:

Students entering the M. Tech in Embedded Systems and Solutions programme are expected to come with prior knowledge of programming and electronic system design. While we do not wish to conduct full-fledged programming courses at the Masters level, we will provide an opportunity for the students to hone up their programming skills in a structured way as part of the preparatory term. The preparatory term has one course in programming (covering essentials of programming languages in general). The other course on electronic system design will provide an opportunity to get hands-on with electronic circuits, systems and simulation tools. The two courses will not carry any credits. However, they are mandatory courses with a PASS/FAIL grade. The Programming and Electronic Circuits and Systems will be taught with emphasis on hands-on activities.

Winter Term Courses:

Students admitted to the second semester of the M. Tech programme in Embedded Systems and Solutions are required to qualify a non-technical course on Research Methodology which is expected to be completed by the student through self-study and a seminar on some contemporary topic in the discipline of electronic system design. These two courses in the second semester will carry two credits each.

Pre-Internship and Internship:

In Pre-Internship, students shall choose a specific domain for their Internship and identify prospective organizations and apply for Internship programmes. For Pre-Internship work, a counselor will be assigned to each student, who at the beginning of the 3rd semester shall guide him/her regarding identifying the prospective organizations and applying therein.

Internship shall be of six months (Minimum 18 weeks') duration and a student can accumulate 24 credits on successful completion of internship. Internships shall be considered as six months (not less than 18 weeks) of supervised learning carried out at industry or some academic institution of excellence. Students are encouraged to apply for internship in 3rd semester to companies or academic institutions so that its commencement is ensured at the beginning of 4th semester.

Pre-Project, Project and Thesis:

In the Pre-Project work, students shall choose a specific topic/area for their project. A supervisor will be assigned to each student, who at the beginning of the 3rd semester shall provide a syllabus and plan of study including relevant research papers to the student.

Project and Thesis shall be of six months (Minimum 18 weeks') duration and a student can accumulate 24 credits on successful completion of Project. This is in addition to pre-project work in 3rd semester wherein students shall choose a specific topic/area for their project and undertake its study.

Semester – I *(Preparatory Term)*

ESS-101P: Principles of Electronic Circuits, Systems and Devices

Hours per Week			Credits	Maximum Marks			Examination Hours
Lecture	Tutorial	Practical		Internal	End Term	Total	
4	2	8	0	50	100	150	3 Hours

Learning Objectives

- *To recapitulate the topics of electronics learnt in Bachelor's course.*
- *To prepare students for the M. Tech Course*

Unit 1: Overview of Networks, Signals and Systems

Network solution methods: nodal and mesh analysis; Network theorems: Fourier series and Fourier transform, sampling theorem and applications; DFT, FFT, Z-transform, LTI systems, digital filter design techniques.

Unit 2: Overview of Electronic Devices

Semiconductor Physics, Diode, BJT, MOS capacitor, MOSFET, solar cell; Integrated circuit fabrication process, twin-tub CMOS process.

Unit 3: Overview of Analog Circuits

Diode circuits Single-stage BJT and MOSFET amplifiers: biasing and frequency response; multi-stage and differential amplifiers, operational amplifier; Simple op-amp circuits, Active filters; Sinusoidal oscillators, 555 timers; Voltage reference circuits. Data converters: sample and hold circuits, ADCs and DACs.

Unit 4: Overview of Digital Circuits

Number systems; Combinatorial circuits: Boolean algebra, minimization of functions, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers; Semiconductor memories: ROM, SRAM, DRAM

Unit 5: Overview of Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, Digital communications: PCM, DPCM, digital modulation schemes..

Text and Reference Books:

Text Books:
1. *Neil Sclater, Electronics Technology Handbook, Tata McGraw Hill, 1999.*
2. *Poul Horowitz and Winfield Hill, Art of Electronics, Cambridge University Press, 2nd edition 1989.*
3. *David A Bell, Electronic Devices And Circuits, Oxford University Press.*
4. *Wayne Tomasy, Advanced Electronic Communication System, Phi Publishers.*

References:
5. *Robert L. Boylested, Louis Nashelsky, Electronic Devices And Circuit Theory, Pearson Education George Kennedy, Bernard Davis, Electronic Communication Systems, Mc Graw Hill.*

Semester – I (*Preparatory Term*)

ESS-102P: Programming and Problem Solving Techniques

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
4	2	8	0	50	100	150	3 Hours

Learning Objectives

- *To understand the basic concepts of problem solving approaches from the basics of mathematical functions and operators to the design and use of techniques such as codes, arrays, pointers, other data structures, and object-oriented programming concepts.*
- *To explore problem-solving tools, such as problem analysis charts, interactivity charts, IPO charts, algorithms, and flowcharts and Universal Modelling Language (UML), to design a solution to a problem.*
- *To design, implement, test, and apply various logic structures, data structures and advanced concepts such as libraries, and multi file programming paradigms through C programming language.*

Unit 1: Introduction to Problem Solving and Programming

General Problem-Solving Concepts - Problem Solving in Everyday Life, Types of Problems, Problem Solving with Computers, Difficulties with Problem Solving. Planning Solutions – Organizing Solutions (Problem Analysis, Interactive Chat, IOP Chat, Writing Algorithm, Drawing Flowchart, Pseudocode, Documentation) – Introduction to UML, Testing and Coding Solutions. Problem Solving Concepts for the Computers – Constants and Variables, Data Types, Operators, Expressions, Functions and Equations. Programming examples in C.

Unit 2: Logic Structures

The Sequential Logic Structures. The Decision Logic Structure, Multiple If/Then/Else Instructions, Straight-Through Logic, Positive Logic, Negative Logic, Logic Conversion, Decision Tables, The Case Logic Structure, Loops – The Loop Logic Structure, Nested Loops, recursion. Program Structures – Modules and their Functions, Cohesion and Coupling, Local and Global Variables, Parameters, Return Values, Variable Names and the Data Dictionary. Programming examples in C.

Unit 3: Data Structures - I

Arrays – One-Dimensional, Two-Dimensional and Multidimensional Arrays and their processing, Table Look-Up Technique, Sequential Search, Binary Search., Frequency Distribution, Cross-Tabulation. Sorting techniques. Pointers – Address operators and arithmetic, functions and pointers, arrays and pointers, pointer arrays, pointer to pointer. Programming examples in C.

Unit 4: Data Structures - II

Structures, Unions, Enumeration, Bit Fields and their processing. Stacks, Queues, their operations and applications. File Data Structure and Processing. Programming examples in C.

Unit 5: Object Oriented Programming

Introduction to Object-Oriented Programming – Classes, Inheritance, Polymorphism, Encapsulation, Objects, Methods, Instance versus Static Methods, Introduction to use of UML as a Design Tool. Programming examples in C++.

Text and Reference Books:

1. *Problem Solving & Programming Concepts, Maureen Sprankle and Jim Hubbard, 9th ed. 2012, Pearson Education.*
2. *C How to Program, Deitel and Deitel, Pearson Education. 6th edition, 2010.*
3. *Introduction to Computers, Peter Norton, Sixth Edition, Tata McGraw Hill Publications, 2007.*
4. *How to solve it by computer, R.G.Dromey, Pearson education , fifth edition, 2007.*
5. *Fundamentals of Computing and Programming in C, Pradip Dey, Manas Ghosh, First Edition, Oxford University Press, 2009.*
6. *Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein, McGraw Hill, Publishers, 2002.*
7. *Programming in C, Reema Thareja, Oxford University Press, 2011.*

Semester – I (*Course Work*)
ESS-103C: Fundamentals of Embedded Systems

Hours per Week			Credits	Maximum Marks			Examination Hours
Lecture	Tutorial	Practical		Internal	End Term	Total	
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To introduce the concept and functioning of Embedded Systems.*
- *To learn core components of Embedded Systems.*
- *To learn various processes involved in the design of an Embedded System.*
- *To learn various aspects of operating systems applicable to Embedded Systems.*
- *To undertake case study of various RTOS to understand their working and design.*

Unit 1: Introduction to Embedded Systems

Definition of Embedded Systems, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Embedded Systems Model, Major application areas, Purpose of Embedded Systems, Characteristics and quality attributes of Embedded Systems.

Unit 2: Typical Embedded Systems

Core of the embedded system, General purpose and domain specific processor, ASICs, PLDs, Commercial off the shelf Components (COTS), Memory: RAM, ROM, Memory according to the type of interface, Memory Shadowing, Memory selection for embedded system, Sensors and actuators, Introduction to Communication Interface (Onboard and External).

Unit 3: Embedded System Design Process

Embedded system project development, Design issues and co-design issues in system development process, The Embedded Design Life Cycle, Selection Process, The Partitioning Decision (Hardware and Software partitioning), The Development and Debugging Environment (use of target machine or its emulator and In-Circuit emulator), Special Software Techniques, Introduction to BDM, JTAG, and Nexus.

Unit 4: Embedded System OS

Types of operating systems, Tasks, Processes and Threading, Multi-processes and Multithreading, Process Management (Concepts, Scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms), Shared Memory, Message Passing, Remote Procedure Call, sockets, Thread Management (Multi thread models, threading issues, Thread libraries, Synchronization), Mutex (Creating, Deleting, Prioritizing Mutex, Mutex internals).

Unit 5: RTOS Design and Case Study

RTOS terminology and definition, Real Time design issues with examples, Hardware Consideration (logic states, CPU, Memory, Architectures), RTOS building blocks, Real-Time Kernel, RTOS Case Study (any 2 of following: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS, Salvo, Android OS).

Text and Reference Books:

1. *Introduction to Embedded Systems, A Cyber physical approach, Edward A. Lee and Senjit A. Seshia.*
2. *Embedded Systems Design: An Introduction to Processes, Tools, and Techniques, by Arnold S. Berger, CMP Books.*
3. *Real time system design and analysis by Philips A. Laplante.*
4. *Embedded Linux: Hardware, Software and Interfacing, Dr. Craig Hollabaugh.*
5. *Real Time Concepts for Embedded Systems, Qing Li, Elsevier, 2011.*

Semester – I (*Course Work*)

ESS-104C: Microcontrollers for Embedded System Design

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To learn core components and functionalities of microcontrollers.*
- *To understand PIC series of microcontrollers in terms of their architecture, programming and interfacing.*
- *To learn programming of PIC series of microcontrollers and learn building of hardware circuits using PIC 16F series of microcontrollers.*
- *To learn emerging trends in the design of PIC series of microcontrollers employing advanced features such as Controller Area Networking, etc.*

Unit 1: Introduction to Microcontrollers

Introduction to Computer Systems, Introduction to Harvard & Von Neuman Architectures, CISC & RISC Architecture, Introduction to Microprocessors and Microcontrollers, Comparison of Microcontroller with Microprocessor, Microcontroller Applications, Classification, Trends, Introduction to Various Features of Microcontrollers.

Unit 2: PIC 16F Microcontroller Series

Introduction to PIC Microcontroller families (8/16 and 32 bit), PIC 16F series family overview of architecture and peripherals, Pin diagram and Architecture of PIC16F84/PIC16F84A Microcontroller, Memory organization, configuration, memory addressing, and special function registers, parallel and serial ports, timer and counters. Special features of PIC16F84A (OSC Selection, RESET - Power-on Reset (POR), Power-up Timer (PWRT), Oscillator Start-up Timer (OST), Interrupts, Watchdog Timer (WDT), SLEEP, Code Protection, ID Locations, In-Circuit Serial Programming, interrupts). Architectural overview of PIC 16F877/PIC 16F887A.

Unit 3: Instruction Set and Programming

PIC 16F series instruction set (data movement, arithmetical, logical, branch control, etc.), Instruction format, assembly language programming for PIC16F84/PIC16F84A and PIC 16F877/PIC 16F887 microcontrollers, Writing ALP programs for PIC microcontrollers.

Unit 4: Devices Interfacing and Programming

Introduction to basic I/O devices (LED's, 7-Segmnt Displays, Switches and Keyboard Matrix), Use of subroutines and Interrupt in programming, programming with Timers and Counters, Using I/O ports in programming, LCD interfacing, Using ADC in programming, Serial communication.

Unit 5: Advanced PIC Microcontrollers

Introduction to 18F, 24F and 32F series of PIC microcontrollers, their architecture and feature introduction, Overview of advanced features (Stacks, Infrared and Radio connectivity, Controller Area Network, Local Interconnect network, Real time clock and calendar).

Text and Reference Books:

1. *Designing Embedded Systems with PIC Microcontrollers: Principles and Applications, 2nd Edition, Tim Wilmshurst, Elsevier Publication.*
2. *Interfacing PIC Microcontrollers Embedded Design by Interactive Simulation by Martin Bates, Elsevier Publication.*
3. *PIC Microcontroller and Embedded Systems Using Assembly and C for PIC 18 by Muhammad Ali Mazidi, Rolin D. McKinlay and Danny Causey, Pearson Publication.*
4. *Advanced PIC Microcontroller Projects in C from USB to RTOS with the PIC18F Series by Dogan Ibrahim, Elsevier Publication.*

Semester – I (*Course Work*)
ESS-105C: Advanced Digital System Design

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	0	50	100	150	3 Hours

Learning Objectives and Course Outcomes

- *Learning Objectives: To expose the students to the digital system design, To introduce logics for design of Programmable Devices, To comparatively study the classification of commercial family of Programmable Devices, To expose the students to the layout and its rules, Understand the programming concept for HDL and Design the simple application by using VHDL code.*
- *Course Outcomes: After going through this course the student will be able to Understand concepts of Digital design (Combinational and Sequential), Understand the concepts of programmable logic devices. Design subsystems Interfacing different devices to the processor, Design layouts with given design rules and Test the circuits in behavioural language (VHDL)*

Unit 1: Introduction

Overview of digital VLSI design methodologies – Trends in IC Technology – Advanced Boolean algebra – Shannon's expansion theorem – Consensus theorem – Octal designation- Run measure – Buffer gates – Gate expander – Reed Muller expansion – Synthesis of multiple output combinational logic circuits by product map method – Design of static hazard free, dynamic hazard free logic circuits.

Unit 2: Digital Design

Static and Dynamic CMOS design- Domino and NORA logic - combinational and sequential circuits. Arithmetic circuits in CMOS VLSI - Adders- multipliers- shifter -CMOS memory design - SRAM and DRAM. Bipolar gate Design- BiCMOS logic - static and dynamic behaviour -Delay and power consumption in BiCMOS Logic.

Unit 3: Subsystem Design Process

General arrangement of 4-bit Arithmetic Processor, Design of 4-bit shifter, Design of ALU sub-system, Implementing ALU functions with an adder, Carry-look-ahead adders, Multipliers, Serial Parallel multipliers, Pipeline multiplier array, modified Booth's algorithm.

Unit 4: Layout and Design Rules

Layout diagram, Stick diagram, Need for Design Rules, Mead Conway Design Rules for the Silicon Gate NMOS Process, CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wire Capacitance, Drive Large Capacitive Load

Unit 5: Logic Synthesis, Simulation and Testing

Basic features of VHDL language for behavioural modelling and simulation – Summary of VHDL data types –Dataflow and structural modelling – VHDL and logic synthesis – Circuit and layout verification – Types of simulation – Boundary scan test – Fault simulation – Automatic test pattern generation – design examples.

Text and Reference Books:

Text Books:
1. *Charles.H.Roth, Jr, "Digital Systems Design using VHDL", PWS Publishing Company, 2001.*
2. *Fredrick J. Hill and Gerald R. Peterson, "Computer Aided Logical Design with emphasis on VLSI", 4th edition, Wiley, 1993.*
3. *Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits - Analysis & Design",*
4. *MGH, Second Ed., 1999*
5. *Jan M Rabaey, "Digital Integrated Circuits-A Design Perspective", Prentice Hall, 1997*
6. *Eugene D Fabricus, "Introduction to VLSI Design,"McGraw Hill Intnl Edition.1990*

References:

7. *Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2000*
8. *Neil H E West and Kamran Eshranghian,"Principles of CMOS VLSI Design: A System*
9. *Perspective", Addision-Wesley 2nd Edition,2002.*
10. *R. J. Baker, H. W. Li, and D. E. Boyce, "CMOS circuit design, layout, and simulation". New York: IEEE Press, 1998.*

Semester – I (*Course Work*)
ESS-106C: Wireless Communication and Networks

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	0	50	100	150	3 Hours

Learning Objectives

- *To Study the Fundamentals of Wireless Networks, and Existing Architecture of Wireless Networks, To provide a comprehensive background knowledge of Wireless Communication, To Define different types of Wireless Topologies, constraints of wireless Networks, Need of the wireless and Adhoc Networks, To learn Protocols used in the Wireless Networks and Security of the wireless Sensor Networks.*

Unit 1: The Cellular Concept-System Design Fundamentals

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Practical Handoff Considerations, Interference and System capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

Unit 2: Mobile Radio Propagation: Large-Scale Path Loss

Introduction to Radio Wave Propagation, Free Space Propagation Model, Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Scattering, Outdoor Propagation Models, Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modelling.

Unit 3: Mobile Radio Propagation: Small Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects, Statistical Models for multipath Fading Channels Introduction to RAKE Receiver.

Unit 4: Equalization and Diversity

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Nonlinear Equalization, Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive Equalization, Diversity principles and Techniques, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity.

Unit 5: Wireless Networks

Introduction to wireless Networks, Various Wireless technologies, Shared Wireless Access Protocol (SWAP), WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a, b, g and n standards, IEEE 802.16 and its enhancements, Wireless PANs (architecture and applications), Introduction to Hipper LANS, WLL.

Text and Reference Books:

1. *Wireless Communication and Networks, William Stallings, prentice Hall Ltd...*
2. *Wireless Communications: Principles & Practices, Rappaport, Prentice Hall Ltd.*
3. *Modern Wireless Communications, Haykin and Moher, Prentice Hall Ltd.*
4. *Fundamentals of Wireless Communication, David Tse, Pramod Vishwanath, Cambridge University Press.*
5. *Handbook of Wireless & Mobile Computing, Ivan Stojmenovic, john Wiley and Sons.*
6. *Wireless Communication and Networking, Vijay Garg, Morgan koufman, Elsevier.*

Semester – I *(Course Work)*
ESS-107L: Embedded System Design Lab

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	0	70	80	150	3 Hours

List of Experiments

1. To write basic ALP for PIC 16F84/16F877A microcontroller.
2. Interfacing of LED with PIC16F84/16F877A Microcontroller.
3. Interfacing a Switch with PIC16F84/16F877A Microcontroller.
4. Interfacing of both LED and Switch with 16F84/PIC16F877A Microcontroller.
5. Matrix keypad interfacing with 16F84/PIC16F877A Microcontroller.
6. PIC 16F84/16F877A Microcontroller and Seven segment interfacing.
7. Development of Software for Timer peripheral.
8. PIC 16F84/16F877A Microcontroller and LCD Interfacing.
9. Using of internal EEPROM.
10. ADC Interfacing: a) 8-bit ADC Interfacing, b)10-bit ADC Interfacing.
11. PWM signal generation at various frequencies.
12. Interfacing of PIC16F877A Microcontroller and sensor having analog output.
13. Interfacing of PIC16F877A Microcontroller and sensor having digital output.
14. Interfacing PC to PIC16F877A Microcontroller using UART.
15. Interfacing of RF Transmitter and Receiver with PIC16F877A Microcontroller.
16. PIC16F877A Microcontroller and Seven Segment Display interfacing using SPI
17. PIC16F877A Microcontroller and LCD Interfacing using SPI.
18. PIC16F877A Microcontroller and LCD Interfacing using I2C.
19. Case study of Embedded Real Time Operating systems.

Semester – I *(Course Work)*
ESS-108L: Advanced Digital System Design and Wireless Communication Lab

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	0	70	80	150	3 Hours

List of Experiments

Experiments on Advanced Digital System Design

1. Review Experiments using Cadence Virtuso tool kit on the design of
   - Combinational logic circuits
   - Sequential logic circuits
   - Arithmetic circuits
2. Experiments on the design of subsystems on Cadence Virtuso tool kit.
3. Learning Layout in Cadence Virtuso tool kit.
4. Programs using VHDL on the design of
   - Combinational logic circuits
   - Sequential logic circuits
   - Arithmetic circuits

Experiments on Wireless Communication

5. To Demonstrate Infrastructure and Adhoc wireless Network.
6. To establish the connectivity between devices using Bluetooth and infrared
7. To Design a wireless communication System using RF transmitter and receiver kit/RF Modules.
8. To configure a wireless network using Raspberry PI/Arduino/LPC Boards.
9. To design a wireless network using Wi-Fi IEEE 802.11 Wireless Module Hardware.
10. To configure the Simple Web Server using Raspberry PI/Arduino/LPC Boards.
11. Ten Experiments on Wireless Communication and Networks using Matlab.

Semester – II *(Winter Term)*
ESS-201R: Research Methodology *(Self Study)*

Hours per Week			Credits	Maximum Marks			Examination Hours
Lecture	Tutorial	Practical		Internal	End Term	Total	
0	0	0	2	25	50	75	1 ½ Hours

Learning Objectives

- *To import the knowledge on analysis of research methodology.*
- *The students will be able to estimate the performance of different testing method for research.*
- *The Students will be able to analysis the methods used for data collection hypothesis.*
- *testing and sampling process for research methodology.*

Unit 1: Introduction

Definition, mathematical tools for analysis, Types of research, exploratory research, conclusive research, modelling research, algorithmic research, Research process- steps. Data collection methods- Primary data – observation method, personal interview, telephonic interview, mail survey, questionnaire design. Secondary data- internal sources of data, external sources of data.

Unit 2: Sampling Methods

Scales – measurement, Types of scale – Thurstone's Case V scale model, Osgood's Semantic Differential scale, Likert scale, Q- sort scale. Sampling methods- Probability sampling methods – simple random sampling with replacement, simple random sampling without replacement, stratified sampling, cluster sampling. Non-probability sampling method – convenience sampling, judgment sampling, quota sampling.

Unit 3: Hypotheses Testing

Testing of hypotheses concerning means -one mean and difference between two means -one tailed and two tailed tests, concerning variance – one tailed Chi-square test.

Unit 4: Research in Embedded Systems

Embedded System: Scope – Economics Stakes – Trends – State of Art – Examples: Air Traffic control – The Next Generation: Technological challenges – Scientific challenges - Cost.

Unit 5: Challenges and Case Study

Physical Systems Engineering: Analytical Models – Computing Systems Engineering: Computational Models – Proposed Vision: Multidisciplinary Integration – Sub – Challenge: Integrate Analytical and Computational Models. Case Study: apply Research Methodology principles into design and manufacturing field.

Text and Reference Books:

1. *Kothari, C.R., Research Methodology –Methods and Techniques, New Age Publications, New Delhi, 2009.*
2. *Panneerselvam, R., Research Methodology, Prentice-Hall of India, New Delhi, 2004.*

Semester – II *(Winter Term)*
ESS-202S: Seminar

Hours per Week			Credits	Maximum Marks			Examination Hours
Lecture	Tutorial	Practical		Internal	End Term	Total	
0	0	0	2	75	0	75	1 ½ Hours

Details

Each student shall present a seminar in the 2nd semester on a topic relevant to Embedded Systems for about 30 minutes. The topic should not be a replica of what is contained in the syllabus. The topic shall be approved by the Seminar Evaluation Committee of the Department. The committee shall evaluate the presentation of students. Seminar report in the prescribed form shall be submitted to the department after the approval from the committee.

Semester – II *(Course Work)*

ESS-203C: Advanced Embedded Programming Languages

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To impart advanced concepts of programming languages such as libraries, low level features, programme structures, pre-processor directives, project files, and other concepts as applicable to embedded systems.*
- *To introduce object oriented programming concepts such as classes and templates for real time programming and writing code for microcontrollers using C++.*
- *You also learn how to use the Keil uVision IDE to create projects, build and download them to the board.*
- *To provide hands-on-skills with the use of Embedded Java and Note.js for making embedded systems accessible through the Web.*

Unit 1: Advanced Topics in C

Review of Basic concepts of C programming, C's pre-processor directives, Libraries in C, Multifile Programs. Project Files, writing assemble language routines in C, Header files for Project and Port, Real-time constraints, Creating hardware delays, Timeout mechanism - Creating loop and hardware timeouts.

Unit 2: Introduction to IDE's and Advanced Embedded languages

Introduction to Keil, Installing the Keil software and loading the project, Configuring the simulator, Building the target, Running the simulation, Dissecting the program, Building the hardware. Writing programs using Keil, generating hex files and downloading them to the board. Introduction to Atmel Studio. Introduction to Real Time C++, Introduction to Embedded Java and J2ME. Introduction to Web Technology for Embedded Systems. Introduction to Node.js and JSON.

Unit 3: Real Time C++ Programming

Syntax of C++, Classes and Objects, Standard libraries, Low Level Register access, Real Time Programming on a board, Data types, the bool type, Namespaces, Basic classes and Templates, using <limits>, Basic STL Algorithms, Digital Separators and Binary Literals.

Unit 4: C++ Programming for Microcontrollers-I

Object oriented technique for microcontrollers, C++ Templates for Microcontrollers (Functions, Scalability and Code Re-Use) Optimized C++ Programming for Microcontroller, Custom Memory Management, Programming Examples.

Unit 5: C++ Programming for Microcontrollers-II

Accessing Microcontroller Registers, Code designing process for Microcontrollers, Low-level Hardware Drivers in C++, C++ Multitasking, Floating Point Mathematics, Programming Examples.

Text and Reference Books:

1. *Real Time C++: Efficient object oriented & template Microcontroller programming, 2nd Edition, Christopher Kormanyos, Springer, 2015.*
2. *Embedded C, Michael J Pont, Pearson publications, 2007.*
3. *Test Driven development for Embedded C, James W Grenning, 2011.*
4. *Node.js for Embedded Systems, Patrick Mulder, Kelsey Breseman, O'Reilly Media, 2015.*
5. *Java Card Technology for Smart Cards: Architecture and Programmer's Guide, Zhiqun Chen, Eddison-Wesley Professional, 2000.*

Semester – II *(Course Work)*
ESS-204C: CPLD and FPGA Architectures

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives and Course Outcome

- *Learning Objectives: To develop rigorous foundation in VLSI Architectures, CMOS and its Design Methodologies, To analyse programmable ASICs, To obtain basic knowledge of synthesis. To introduce the student to digital design using Field Programmable ICs, and to provide an understanding of the underlying technologies and architectures of these Integrated Circuits. To prepare students for the design of practical digital hardware systems using VHDL*
- *Course Outcomes: Modelling and simulation of digital VLSI systems using hardware design language, Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages, Use of FPGA for various applications.*

Unit 1: : Introduction to Programmable Logic Devices

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

Unit 2: Field Programmable Gate Arrays

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs

Unit 3: SRAM Programmable FPGAs

Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

Unit 4: Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

Unit 5: Design Applications

General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

Text and Reference Books:

Text Books:

1. *Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.*
2. *Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.*

Reference Books:

1. *Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.*
2. *Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.*
3. *Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.*
4. *FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.*

Semester – II (*Course Work*)

ESS-205C: Embedded System Design with ARM Cortex Microcontrollers

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

While there has been a lot of growth in embedded systems, recent tight integration of sensors and actuators, coupled with readily available networking, provide opportunity for even more explosive growth. The major architecture of embedded processors is ARM. It has recently created much more useable, efficient and powerful processor families that facilitate faster and better all-integrated development of embedded hardware, software, networking and sensing/actuating functions. The Course objectives include understanding of the design methods, tools and flows in developing embedded systems; understand modern embedded processor architectures; learn the advantages of modern ARM Cortex M processors for faster/better design, debug and execution; to be able to use modern software frameworks for embedded systems including CMSIS-DSP and CMSIS-RTOS.

Unit 1: Introduction to ARM

A brief history of ARM, evolution, Architecture versions and Thumb ISA, Processor naming and ARM ecosystem, Cortex - M processor family, Advantages of the Cortex -M processors, Applications of the ARM Cortex-M processors, Introduction to Cortex-M3 and Cortex-M4 processors (Processor architecture, Instruction set, Block diagram, Memory system, Interrupt and exception support).

Unit 2: Architecture of Cortex M3 and M4 Processors

Programmer's model, Operation modes, Registers, Memory System, features, stack memory, memory requirements, endianness, bit band operations, access permissions and attributes, memory barriers, Low power design and features, low power application development, overview of exceptions and interrupts, exception types and interrupt management, vector table, exception sequence, use of NVIC register, SCB register and other special registers for exception and interrupt control, configuration control and auxiliary control registers.

Unit 3: Instruction Set of Cortex M3 and M4 Processors

Evolution of ARM ISA, Comparison of the instruction set in ARM Cortex-M Processors, Unified Assembly Language, Addressing modes, Instruction set, Program flow control (branch, conditional branch, conditional execution, and function calls), Multiply accumulate (MAC) instructions, Divide instructions, Memory barrier instructions, Exception-related instructions, Sleep mode-related instructions, Other functions, Introduction to Cortex-M4 processor support for Enhanced DSP instructions, Writing C and Assembly language programs.

Unit 4: Cortex OS Support and Memory Protection

OS support features, Shadowed stack pointer, SVC and PendSV exception, Context switching, Exclusive accesses and embedded OS, MPU overview, MPU registers (type, control, region number, region base attribute, region base address, alias), memory barrier configuration, memory management faults, fault handlers, exception handling faults.

Unit 5: Floating Point Operations

Review of floating point numbers, Cortex M4 floating point unit (FPU), floating point registers, Lazy stacking, interrupt of lazy stacking, Floating point exceptions. Introduction to advanced features of Cortex M3 and M4 processors. Introduction to Debug and trace, Debug architectures, modes and events.

Text and Reference Books:

1. *The Definitive Guide to ARM Cortex M3 and Cortex-M4 Processors, Third Edition, Joseph Yiu, Elsevier Publication, 2015.*
2. *Assembly Language Programming ARM Cortex-M3 by Vincent Mahout Wiley Publication, 2012.*
3. *Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, Yifeng Zhu, 2nd Edition, E-Man Press LLC Publication, 2015.*
4. *ARM Assembly Language Fundamentals and Techniques, William Hohl and Christopher Hinds, CRC Press, 2015.*
5. *Embedded Systems: Introduction to Arm(r) Cortex -M Microcontrollers: 1, Jonathan W Valvano, 2015.*

Semester – II *(Course Work)*

ESS-206E1: Statistical Signal Processing

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To expose the concepts of feed forward neural networks.*
- *To explore the concepts of multi rate signal processing and multi rate filters.*
- *To study the adaptive filters and its applications.*
- *To learn fundamental concepts on signal processing in power spectrum estimation.*
- *The student will be able to a) Acquiring knowledge of how a multi rate system works, b) Ability to design and implement decimator and interpolator and to design multi rate filter Bank, c) Understanding different spectral estimation techniques and linear prediction. And d) Ability to design LMS and RLS adaptive filters for signal enhancement, channel equalization*

Unit 1: Multirate Signal Processing

Introduction-Sampling and Signal Reconstruction-Sampling rate conversion – Decimation by an integer factor – interpolation by an integer factor –Sampling rate conversion by a rational factor –poly-phase FIR structures – FIR structures with time varying coefficients - Sampling rate conversion by a rational factor- Multistage design of decimator and interpolator.

Unit 2: Multirate FIR Filter Design

Design of FIR filters for sampling rate conversion –Applications of Interpolation and decimation in signal processing –Filter bank implementation –Two channel filter banks-QMF filter banks – Perfect Reconstruction Filter banks – tree structured filter banks - DFT filter Banks – M-channel filter banks- octave filter banks

Unit 3: Linear Estimation and Prediction

Linear prediction- Forward and backward predictions, Solutions of the Normal equations-Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter.

Unit 4: Adaptive Filters

FIR Adaptive filters - Newton's steepest descent method – Adaptive filters based on steepest descent method - LMS Adaptive algorithm – other LMS based adaptive filters- RLS Adaptive filters - Exponentially weighted RLS - Sliding window RLS - Simplified IIR LMS Adaptive filter.

Unit 5: Power Spectral Estimation

Estimation of spectra from finite duration observations of a signal –The Periodogram-Use of DFT in Power Spectral Estimation –Non-Parametric methods for Power Spectrum Estimation – Bartlett. Welch and Blackman–Tukey methods –Comparison of performance of Non – Parametric power spectrum Estimation methods –Parametric Methods - Relationship between auto correlation and model parameters, Yule-Walker equations, solutions using Durbin's algorithm, AR, MA, ARMA model based spectral estimation. Applications of adaptive filters: Adaptive channel equalization Adaptive echo canceller - Adaptive noise cancellation-, 1/M octave-band filter banks, Speech enhancement using spectrum estimation

Text and Reference Books:

1. *H. Monson Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., 2008.*
2. *G. John Proakis and G. Dimitris Manolakis, Digital Signal Processing, Pearson Education, 2006.*
3. *P.P.Vaidyanathan , Multirate Syatems and Filter Banks, Pearson Education, 2008.*
4. *N.J.Filege, Multirate Digital Signal Processing, John Wiley and Sons, 2000.*
5. *G..John Proakis, Algorithms for Statistical Signal Processing, Pearson Education, 2002.*
6. *G.Dimitris and G.Manolakis., Statistical and Adaptive Signal Processing, McGraw Hill, 2002.*
7. *Sophoncles J. Orfanidis, Optimum Signal Processing, McGraw Hill, 2007.*

Semester – II (*Course Work*)

ESS-206E2: Sensors and Actuators

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Learning Objectives: To expose students to various types of Transducers, To expose students to various applications of Transducers and To acquaint students with the design of various types of Transducers.*
- *Course Outcomes: After going through this course the student will be able to use sensors for particular application, Design sensors for particular application and Think about the design of new types of sensors.*

Unit 1: Introduction

Sensors / Transducers: Principles – Classification – Parameters – Characteristics – Environmental Parameters (EP) – Characterization. Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors.

Unit 2: Thermal Sensors:

Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermos-sensors – Helium Low Temperature Thermometer – Nuclear Thermometer – Magnetic Thermometer – Resistance Change Type Thermometric Sensors –Thermo-emf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry – Noise Thermometry – Heat Flux Sensors.

Unit 3: Radiation Sensors:

Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors

Unit 4: Smart Sensors:

Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters –Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation.

Unit 5: Actuators:

Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains.

Text and Reference Books:

Text Books
1. *D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.*
2. *W. Bolton – "Mechatronics" –Pearson Education Limited.*

Reference Books
3. *Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013.*

Semester – II *(Course Work)*

ESS-206E3: System on Chip Architecture

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Learning Objectives: The course aims to provide an appreciation for the motivation behind SoC design, the challenges of SoC design, and the overall SoC design flow and to understand SoC Verification flow and complexity in SoC verification.*
- *Course Outcomes: After successful completion of the course, students should be able to: Understand the concept of System on Chip., Get detailed knowledge of SoC Design flow, Get detailed understanding of System on Chip Design process, Get detailed understanding of complexity in verification and to build SoC Verification environment., Understand the different communication architecture used in MpSoC and CO5 Design memory and component based application on MpSoC.*

Unit 1: Motivation for SoC Design

Review of Moore‟s law and CMOS scaling, benefits of system-on-chip integration in terms of cost, power, and performance. Comparison on System-on-Board, System-on-Chip, and System-in-Package. Typical goals in SoC design – cost reduction, power reduction, design effort reduction, performance maximization. Productivity gap issues and the ways to improve the gap – IP based design and design reuse.

Unit 2: System On Chip Design Process

A canonical SoC Design, SoC Design flow, waterfall vs spiral, top down vs bottom up, Specification requirement, Types of Specification, System Design Process, System level design issues, Soft IP vs Hard IP, IP verification and Integration, Hardware-Software codesign, Design for timing closure, Logic design issues, Verification strategy, On chip buses and interfaces, Low Power, Hardware Accelerators in Soc.

Unit 3: Embedded Memories

Cache memories, flash memories, embedded DRAM. Topics related to cache memories. Cache coherence. MESI protocol and Directory-based coherence.

Unit 4: Interconnect architectures for SoC

Bus architecture and its limitations. Network on Chip (NOC) topologies. Mesh-based NoC. Routing in an NoC. Packet switching and wormhole routing.

Unit 5: MPSoCs and Case Study

MPSoCs: What, Why, How MPSoCs, Techniques for designing MPSoCs, Performance and flexibility for MPSoCs design. Case Study: A Low Power Open Multimedia Application Platform for 3G Wireless.

Text and Reference Books:

Reference Books:

1. *"SoC Verification-Methodology and Techniques", Prakash Rashinkar, Peter Paterson and Leena Singh. Kluwer Academic Publishers, 2001.*
2. *Sudeep Pasricha and Nikil Dutt,"On-Chip Communication Architectures: System on Chip Interconnect", Morgan Kaufmann Publishers © 2008.*
3. *Rao R. Tummala, Madhavan Swaminathan, "Introduction to system on package sop- Miniaturization of the Entire Syste", McGraw-Hill, 2008.*
4. *James K. Peckol, "Embedded Systems: A Contemporary Design Tool", Wiley Student Edition.*
5. *Michael Keating, Pierre Bricaud, "Reuse Methodology Manual for System on Chip designs", Kluwer Accademic Publishers, 2nd edition, 2008.*
6. *Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits", Tata Mcgraw-Hill, 3rd Edition.*

Semester – II *(Course Work)*
ESS-206E4: Multimedia and Signal Coding

Hours per Week			Credits	Maximum Marks			Examination Hours
Lecture	Tutorial	Practical		Internal	End Term	Total	
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Learning Objectives: To Identify Different MOS Technologies, their fabrication process, trends and projections, understand basic electrical properties, threshold voltage concepts inform of mathematical equations, Design of combinational networks, analyzation of power optimization, Apply these Concepts to Design validation, Need for clocking disciplines, methods, design validation and testing and understanding of Different Floor planning methods, high level synthesis, off-chip connections.*
- *Course Outcomes: After going through this course the student will be able to Understand the importance of multimedia in today's online and offline information sources and repositories, Understand how Text, Audio, Image and Video information can be represented digitally in a computer, so that it can be processed, transmitted and stored efficiently, Gain a basic understanding of Information Theory which underpins multimedia data compression Algorithms, Understand statistical coding techniques including basic and advanced Video Compression Techniques including MPEG techniques. And Understand the basic audio coding techniques including predictive coding and more advanced techniques based around LPC and sub-band coding.*

Unit 1: Introduction

Introduction to Multimedia: Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats. Color in Image and Video: Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, White Point Correction, XYZ to RGB Transform, Color Models in Images and video, Transformation from RGB to CMYK, Video Color Transforms.

Unit 2: Video and Audio Concepts

Video Concepts: Types of Video Signals, Analog Video, Digital Video. Audio Concepts: Digitization of Sound, Quantization and Transmission of Audio.

Unit 3: Compression Algorithms

Lossless Compression Algorithms: Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression. Lossy Image Compression Algorithms: Transform Coding: KLT and DCT Coding, Wavelet Based Coding. Image Compression Standards: JPEG and JPEG2000.

Unit 4: Video Compression Techniques

Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

Unit 5: Audio Compression Techniques

ADPCM in Speech Coding, G.726 ADPCM, Vocoders – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoders, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

Text and Reference Books:

Text Books
1. *Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.*
2. *Multimedia Signals & Systems – Mrinal Kr. Mandal Springer International Edition 1st Edition, 2009*

Reference Books

3. *Multimedia Communication Systems – Techniques, Stds&Netwroks K.R. Rao, Zorans. Bojkoric, Dragorad A.Milovanovic, 1st Edition, 2002.*
4. *Fundamentals of Multimedia Ze- Nian Li, Mark S.Drew, Pearson Education (LPE), 1st Edition, 2009.*
5. *Multimedia Systems John F. KoegelBufond Pearson Education (LPE), 1st Edition, 2003.*
6. *Digital Video Processing – A. Murat Tekalp, PHI, 1996.*
7. *Video Processing and Communications – Yaowang, JornOstermann, Ya-QinZhang, Pearson, 2002*

Semester – II *(Course Work)*
ESS-207L: ARM Cortex Microcontroller Lab

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	0	70	80	150	3 Hours

List of Experiments

1. Exploring GPIO lines of LPC1768 and interfacing it with LEDs and blinking it in different fashion.
2. Interface Switch and Relay to LPC1768. If a switch is pressed then the relay would be ON and if another switch is pressed relay would be OFF.
3. Interface 16X2 LCD to LPC1768 and display a string on it.
4. Study UART protocol and perform following experiments in polling mode as well as Interrupt mode. a) Transmit a string of characters on UART; b) Receive a string of characters on UART.
5. Interfacing Seven Segment Display to LPC1768.
6. Write a program to show digital values using on chip ADC.
7. Interfacing TFT display to LPC1768.
8. Implementing ETHERNET protocol using LPC1768.

Additional Experiments (using Cortex M4) (Any Three)

9. Explore GPIO lines of ARM Cortex M4 and interface Matrix Keypad to it and display key code of the corresponding key pressed.
10. Study I2C protocol and interface I2C based EEPROM to ARM Cortex M4 and write and read a character on EEPROM.
11. Study SPI protocol and interface SPI based EEPROM to ARM Cortex M4 and write and read a character on EEPROM.
12. Write a program to set and display date and time of on chip RTC.
13. Write a program to generate different wave form like square, triangular, Sine wave using DAC.
14. Study CAN protocol and Write a program for CAN self-test
15. Write a program to understand watch dog timer.

Semester – II *(Course Work)*
ESS-208L: CPLD and FPGA Lab

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	0	70	80	150	3 Hours

List of Experiments

1. Study of Xilinx boards.
2. Study of Actel boards.
3. Designing combinational and sequential circuits on FPGA Kit.
    a) Adders and subtarctors.
    b) Multiplexers and demultiplexers
    c) Encoders and decoders
    d) Flip-Flops
    e) Counters
    f) Shift Registers
    g) RAM
    h) Basic Microprocessor
4. Designing combinational and sequential circuits using VHDL.
    a) Counters
    b) Shift Registers
    c) RAM
    d) Basic Microprocessor
5. Experiments on FPGA applications

Semester – III *(Course Work)*

ESS-301C: Digital Signal Processor and Architecture

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Learning Objectives: To cover techniques for designing efficient DSP architectures, To study the Architectural details of TMS320C54xx DSPs and the concepts involved in execution control and pipelining, To present clear idea of Number formats for signals and sources of errors in DSP implementation, Memory & I/O interfacing for digital signal processors and Implementations of basic DSP algorithms.*
- *Course Outcomes: After going through this course the student will be able to Understand concepts of Digital signal processor, like its architecture, registers etc., Writing programs using the instruction set of DSP processor, Interfacing different devices to the processor., Understand all the peripherals existing on the DSP processor, Apply DSP processors in real time and Ability to analyze the DSP algorithms.*

Unit 1: Introduction

Introduction to DSP Processors: Digital Signal Processors, various architectures: VLIW Architecture, Multiprocessor DSPs, SHARC, SIMD, MIMD, RISC and CISC. Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branch effects, Interrupt effects, Pipeline Programming models.

Unit 2: Typical real-time DSP Systems

Data representations and arithmetic, Conventional number system, redundant number system, residue number system-bit- parallel and bit-serial arithmetic, basic shift accumulator, reducing the memory size, complex multipliers, improved shift – accumulator, Analog - to – digital conversion process, Uniform and non-uniform quantization and encoding, Oversampling in A/D conversion, Digital to analog conversion process: signal recovery, the DAC, Anti-imaging filtering, Oversampling in D/A conversion, Analog I/O interface for real-time DSP systems, sources of errors in DSP implementation, real time implementation considerations.

Unit 3: Fixed-Point DSP Processors

Architecture of TMS 320C 5X, C54X Processors, addressing modes, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors, speed issues.

Unit 4: Memory and I/O Interfacing

External bus interfacing signals, Memory interface, Parallel I/O interface: Programmed I/O, Interrupts and I/O, Direct memory access (DMA). Hardware interfacing, Multichannel Buffered Serial Port (McBSP), McBSP Programming, CODEC interface circuit.

Unit 5: Implementation of DSP Algorithms

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing. An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX.

Text and Reference Books:

Text Books
1. *Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.*
2. *Digital Signal Processing A Practical approach, Second Edition, Emmanuel C. Ifeachor,Barrie W Jervis, Pearson Publications. 2002.*
3. *Keshab K. Parhi, VLSI digital Signal Processing Systems design and Implementation, John Wiley and Sons, 2004.*

Reference Books
4. *Digital Signal processors Architectures, implementations and Applications-SenM.Kuo, Woon-SengS.Gan, Pearson Publications, 2009.*
5. *Digital Signal Processors, Architecture, Programming and Applications – B. VenkataRamani and M. Bhaskar,TMH, 2004.*
6. *Digital Signal Processing – Jonatham Stein, John Wiley, 2005.*
7. *DSP Processor Fundamentals, Architectures and Features – Lapsley , S. Chand, 2000.*
8. *"DSP Applications with TMS 320 Family", K. Shin, Prentice Hall, 1987.*

Semester – III (*Course Work*)
ESS-302C: Mixed Signal Embedded Systems

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Learning Objectives: To introduce the principles of Analog and Mixed Signal System Design, Design and Analysis of Complex Analog and Mixed CMOS Circuits to provide a foundation for more complicated and advanced Designs, To introduce the concept of switched capacitor techniques and To address practical issues in Analog and Mixed Signal System Design*
- *Course Outcomes: After successful completion of the course, students should be able to: Detailed knowledge of static and dynamic behavior of CMOS logic, Detailed understanding of CMOS Digital Subsystem Design, Timing analysis and synchronization of digital design, Basic understanding of Analog circuit building blocks, Detailed understanding of Analog Mixed Signal Circuit Design and Detailed Understanding of Data Converters.*

Unit 1: Analog and Mixed Signal Circuits

Perspective - Analog Signal Processing, Example of Analog Mixed Signal Circuit Design, MOS Transistor operation – analog complementary metal oxide semiconductor circuits, MOS Transistor as a Switch, NMOS, PMOS and CMOS Switches, current mirrors.

Unit 2: Amplifiers - I

Single stage Amplifier: CS stage with resistance load, divide connected load, current source load, triode load, CS stage with source degeneration, source follower, common-gate stage, cascade stage, choice of device models. Frequency response of CS stage: source follower, Common gate stage, Cascade stage and Difference pair. Differential Amplifiers: Mirrors: Basic difference pair, common mode response, Differential pair with OS loads, Gilbert cell.

Unit 3: Amplifiers - II

Operational Amplifiers: One Stage OP-Amp. Two Stage OP-Amp, Gain boosting, Common Mode Feedback, Slew rate, Power Supply Rejection, Noise in Op Amps. Oscillators and Phase Locked Loops: Simple PLL, Charge pump PLL, Non-ideal effects in PLL, Delay locked loops and applications.

Unit 4: Bandgap References and Switched Capacitor Circuits

General Considerations, Supply Independent biasing, PTAT Current Generation, Constant Gm Biasing, Sampling Switches, Switched Capacitor Amplifiers. Switched Capacitor Circuits: Switched capacitor (SC) introduction - offset cancellation - clock feed - through -switched capacitor amplifiers - switched capacitor integrators - switched capacitor filters.

Unit 5: Data Converters

DAC: Static & Dynamic Charatersitics, DAC architectures, ADC : Static & Dynamic Characteristics, Nyquist Criteria , Sample & Hold Circuit ,Quantization error, Concept of over sampling, ADC architectures, Nyqusist rate converters – over sampling converters pipelined/parallel converters - high speed analog to digital converter design, high speed digital to analog converter design and mixed signal design for radar application – Data converter modules used for LIGO.

Text and Reference Books:

Text Books
1. *Allen, CMOS Analog Circuit Design, Oxford, 2005.*
2. *Baker, CMOS Mixed-Signal Circuit Design, Wiley, 2004.*
3. *"Design of Analog CMOS Integrated Circuits", Behzad Razavi, TMH, 2007.*

References
4. *Breems, Continuous-Time Sigma Delta Modulations for A/D Conversion, Kluwer, 2002.*
5. *Michelle Steyaert, Analog Circuit Design, Kluwer, 2003.*
6. *Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley, 2004.*

Semester – III (*Course Work*)

ESS-303E1: Embedded System Security and Forensics

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To introduction of embedded security issue. Security major concerns data, design and system protection.*
- *To learn cryptographic concepts in the context of embedded systems and their unique constraints and requirements.*
- *To expose to forensics procedures and digital data acquisition mechanisms using FKT and FRED*

Unit 1: Introduction

The CIA Triad, Identification, Authentication and Authorization, Security Principles and Models. Network Attacks - Types and Sources, Architecture Security, Secure Network design, Firewalls, introduction to Intrusion Controls (IDS/IPS), Introduction to Wireless LAN Security Standards, The One-Time Pad, Cryptographic Modes, Block Ciphers, Authenticated Encryption, Public Key Cryptography, Key Agreement, Public Key Authentication

Unit 2: Embedded Cryptography

Elliptic Curve Cryptography, Cryptographic Hashes, Message Authentication Codes, Random Number Generation, Key Management for Embedded Systems, Cryptographic Certifications. Introduction to data protection protocols for embedded systems. Internet security for embedded systems, IPsec.

Unit 3: Embedded Systems Security

Embedded system security requirements and issues, embedded software attacks and countermeasures, Hardware Security in Embedded Systems, secured hardware architectures for embedded systems, tamper-resistant hardware, Introduction to trust models for secure embedded hardware and software embedded processing architectures for security, Communications Security in Embedded Systems.

Unit 4: Digital Forensics

The Six A's, Forensic Types: Disk Forensics, Network Forensics, Mobile Device Forensics, Live Forensics, Memory Forensics, Multimedia Forensics, Internet Forensics, Cyber Crime Investigations and Digital Forensics, Disk Based Forensics, Cybercrime, Forensic process and methodology, Digital evidence, Incident response, Searching and analysis tools, Email & Browsers, Intrusion detection, Attack trace-back, Packet inspection, Log analysis, Hashing issues, Anti-forensics (encryption and stealth techniques), Forensics in embedded systems.

Unit 5: Practice with Forensic Tools

Data Acquisition Hardware Tools, Use FRED to create images on different media, recovering the deleted files, Investigative tools (Open Source and Proprietary), Using Forensic Software such as FTK/Encase etc. Use FTK preview evidence, export evidence files, create forensic images and convert existing images, create a case in FTK, Use FTK to process and analyze documents, metadata, graphics and e-mail, Use the FTK Data Carving feature to recover files from unallocated disk space. Web/E-mail forensics analysis, Mobile evidence, Extracting and analysing mobile evidence.

Text and Reference Books:

1. *David Kleidermacher, Mike Kleidermacher, Embedded Systems Security* - Practical Methods for Safe and Secure Software and Systems Development, *Newnes, Elsevier, 2012.*
2. *Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall.*
3. *Francine Krief (Editor), Communicating Embedded Systems: Networks Applications, Wiley.*
4. *John Sammons, Digital Forensics with the AccessData Forensic Toolkit (FTK), MCGRAW HILL COMPANIES*
5. *CEH: Certified Ethical Hacker Version 8 Study Guide by Sean-Philip Oriyano (Author) Publisher sybex*

Semester – III *(Course Work)*
ESS-303E2: Network on Chip

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To understand the fundamentals of 3D NOC.*
- *To impart knowledge about testing and energy issues in NOC.*
- *To understand the router architectures in 3D NOC.*
- *The student will be able to a) Understand the need for 3D NOC, b) Know the concepts used in testing and reduction of power in NOC, and c) Learn the architecture and working of routers in 3D NOC.*

Unit 1: Introduction to Three Dimensional NOC

Three-Dimensional Networks-on-Chips Architectures - Resource Allocation for QoS On-Chip Communication - Networks-on-Chip Protocols-On-Chip - Processor Traffic Modeling for Networks-on-Chip.

Unit 2: Test and Fault Tolerance of NOC

Design-Security in Networks-on-Chips-Formal Verification of Communications in Networks-on- Chips-Test and Fault Tolerance for Networks-on-Chip Infrastructures- Monitoring Services for Networks-on-Chips.

Unit 3: Energy and Power Issues of NOC

Energy and Power Issues in Networks-on-Chips-The CHAIN works Tool Suite: A Complete Industrial Design Flow for Networks-on-Chips

Unit 4: Micro-Architecture of NOC Router

Baseline NoC Architecture – MICRO-Architecture Exploration ViChaR: A Dynamic Virtual Channel Regulator for NoC Routers- RoCo: The Row-Column Decoupled Router – A Gracefully Degrading and Energy-Efficient Modular Router Architecture for On-Chip Networks. Exploring Fault Tolerant Networks-on-Chip Architectures.

Unit 5: DimDE Router for 3D NOC

A Novel Dimensionally-Decomposed Router for On-Chip Communication in 3D Architectures- Digest of Additional NoC MACRO-Architectural Research. ViChaR router – Wormhole router – RoCo Row Column Decoder router.

Text and Reference Books:

1. *Chrysostomos Nicopoulos, Vijaykrishnan Narayanan, Chita R.Das, Networks-on- Chip Architectures AHolistic Design Exploration, Springer, 2009.*
2. *Fayezgebali, Haythamelmiligi, Hqhahed Watheq E1-Kharashi, Networks-on-Chips theory and practice, CRC press, 2009.*
3. *Axel Jantsch , Hannu Tenhunen, Networkson Chip, Publisher: Springer; Soft cover reprint of hardcover 1st ed. 2003 edition (November 5, 2010).*
4. *Giovanni De Micheli, Luca Benini, Networkson Chips: Technology and Tool (Systems on Silicon), Publisher: Morgan Kaufmann; 1 edition (August 3, 2006).*
5. *Jose Flich, DavideBertozzi, Designing Network On-Chip Architectures in the Nanoscale Era, Publisher: Chapman and Hall/CRC; 1 edition (December 18,2010)*

Semester – III (*Course Work*)

ESS-303E3: Adhoc and Wireless Sensor Networks

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

The student should be made to:

- *Understand the design issues in ad hoc and sensor networks.*
- *Learn the different types of MAC protocols.*
- *Be familiar with different types of adhoc routing protocols.*
- *Be expose to the TCP issues in adhoc networks.*
- *Learn the architecture and protocols of wireless sensor networks.*

Unit 1: Introduction

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): Concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

Unit 2: MAC Protocols for AD HOC Wireless Networks

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

Unit 3: Routing Protocols and Transport Layer in Ad Hoc Wireless Networks

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

Unit 4: WSN and MAC Protocols

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

Unit 5: WSN Routing, Localization & QOS

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Text and Reference Books:

1. *Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.*
2. *Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.*
3. *Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005*
4. *Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.*
5. *Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.*

Semester – III (*Course Work*)
ESS-303E4: Embedded Networks and Protocols

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To understand the fundamentals of embedded systems programming, real-time operating systems.*
- *To develop understanding of power-aware protocols for networks of small devices.*
- *To explore newly established standards for embedded systems and ubiquitous computing.*

Unit 1: Embedded Communication Protocols

Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols - RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming.

Unit 2: USB and CAN Bus

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration – Descriptors –PIC18 Microcontroller, USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface.

Unit 3: Ethernet Basics

Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications.

Unit 4: Embedded Ethernet

Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Using FTP – Keeping Devices and Network secure.

Unit 5: Wireless Embedded Networking

Wireless sensor networks – Introduction – Applications – Network Topology – Localization – Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing. ISA/PCI Bus protocols –Firewire - A simple application with CAN - Inside the Internet protocol - Email for Embedded Systems - Data Centric routing.

Text and Reference Books:

1. *Frank Vahid, Givargis Embedded Systems Design: A Unified Hardware/Software Introduction, Wiley Publications, 2002.*
2. *Jan Axelson, Parallel Port Complete, Penram publications, 2011.*
3. *Dogan Ibrahim, Advanced PIC microcontroller projects in C, Elsevier 2008.*
4. *Jan Axelson Embedded Ethernet and Internet Complete, Penram publications, 2005.*
5. *Bhaskar Krishnamachari, Networking wireless sensors, Cambridge press 2005.*

Semester – III (*Course Work*)
ESS-304E1: Internet of Things

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To learn concepts of convergence of technologies leading to the new buzzes such as "Internet of Things" and 'Web of Things".*
- *To understand the architecture, communication pattern and protocols of Internet of Things.*
- *To explore the emerging applications of Internet of Things.*
- *To develop application for Internet of things.*
- *To use hardware platforms such as Raspberry Pi and Arduino to build Internet of Things.*

Unit 1: Introduction

Introduction to concepts behind the Internet of Things, Review of technologies enabling IoT- Sensors, Networks, Standards, Augmented intelligence and Augmented behaviour, Applications of internet of things, IoT Communication Pattern and Layering concepts, Cellular IoT, IoT cloud.

Unit 2: IoT Architectures and Models

Overview of various IoT architectures (European FP7, WSO2, IVM, CISCO, IoT-A, RAMI4.0, IIRA),IEEE P2413 reference architecture model, Functions of application, network, adaptation, MAC and PHY layers, IEEE 802.15.4 standard (Modulation techniques, Frames, Multi-hop communication), Overview of security in IEEE 802.15.4.

Unit 3: IoT Protocols

IoT protocol stack verses traditional protocol stack, CoAP - Working, Frame structure, Security modes and URI addressing, 6LoWPAN - Frame Structure, Header Compression, Fragmentation, Mesh Addressing, RPL – Routing, DODAGE, ICMPV6, DTLS – handshaking, Frame structure, Overview of various other infrastructure, identification, transport, discovery, data, device and semantic protocols.

Unit 4: IoT Hardware & Software

Overview of IoT supported Hardware platforms - Raspberry Pi, ARM Cortex Processors, Arduino and Intel Galileo boards. Sensors and Sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino), Operating systems for IoT, Introduction to IoT web services,

Unit 5: IoT Application Development

Introduction to Integrating Internet Services. XML and JSON. HTTP APIs for accessing popular Internet services (Facebook, Twitter, and others). Practice with developing IoT applications (Sensor integration, node communication, cloud communication and integrating web services).

Text and Reference Books:

1. *.6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley.*
2. *Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers.*
3. *Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann*
4. *The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning.*
5. *Internet of Things (A Hands-on-Approach), Vijay Madisetti , Arshdeep Bahga.*
6. *Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally.*

Semester – III (*Course Work*)
ESS-304E2: RF Microelectronics

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives and Course Outcomes

Learning Objectives
- *To introduce the principles of RF components and devices.*
- *To introduce high frequency amplifier design.*
- *To introduce RF filter design*
- *To introduce low noise amplifiers.*
- *To introduce RF PLL models, RF oscillators and Mixers*

Course Outcomes:
- *After successful completion of the course, students should be able to:*
- *Detailed knowledge of RF design of amplifiers and filters.*
- *Detailed understanding of RF oscillators and mixers.*
- *Detailed understanding of high frequency PLLs.*

Unit 1: Introduction to RF Electronics

Active RF Components and their characteristic parameters: RF diodes, BJT, FET, HEMT.

Unit 2: RF Filter Design

Filter configurations, resonators, filter realizations – Butterworth, Chebychev.

Unit 3: High-Frequency Amplifier Design

Zeros as bandwidth enhancer, shunt series amplifier, bandwidth enhancement with fT doublers, voltage references and biasing, tuned and cascaded amplifiers, RF Power Amplifier Design.

Unit 4: RF Transreceivers

Noise in RF Circuits: types of noise, two port noise theory, Low-Noise Amplifier (LNA) – intrinsic MOSFET two port noise parameters, LNA topologies, design example, LNA Design example.

Unit 5: RF Phase-Locked Loops

Phase-Locked Loops: PLL models, noise properties, sequential phase detectors, loop filters and charge pumps.
RF Oscillators: tuned and negative resistance oscillators.
Mixers: non-linear systems as mixers, multiplier based mixers.

Text and Reference Books:

Text Books
1. *Behzad Razavi, "RF Microelectronics", Pearson Education.*
2. *Reinhold Ludwig, Paul Bretchko,"RF Circuit Design: Theory & Applications ".*
3. *T. H. Lee, The Design of CMOS Radio Frequency Integrated Circuits, CUP.*
4. *R. Ludwig and P. Bretchko, RF Circuit Design, Pearson.*

Reference Books
5. *B. Leung, VLSI for Wireless Communication, PH.*
6. *B. Razavi, Phase-Locking in High-Performance Systems, Wiley/IEEE.*
7. *B. Razavi, Monolithic Phase-Locked Loops and Clock Recovery Circuits, IEEE Press.*
8. *R. E. Best, Phase-Locked Loops : Design, Simulation and Applications, Fifth Edition, MH.*

Semester – III (*Course Work*)
ESS-304E3: Industrial Robotics

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To learn about the hardware, controls, peripheral equipment, and successful implementation of a robotic system in a flexible production environment.*
- *To learn factory communications.*
- *To describe the structure of robot manipulator.*
- *Students will be equipped with the automation and brief history of robot and applications.*
- *Students will be familiarized with the kinematic motions of robot.*
- *Students will have good knowledge about robot end effectors and their design concepts.*

Unit 1: Introduction to Robotics

Robotic Classification, Robot Specifications, Motion – Bug and tangent algorithms, Potential Function, Road maps- Topological roadmaps, Cell decomposition – Trapezoidal and Morse cell decompositions, Sensor and sensor planning- Kinematics-Forward and Inverse Kinematics Transformation matrix and DH Transformation-Inverse Kinematics.

Unit 2: Computer Vision

Projection - Optics, Projection on the Image Plane and Radiometry. Image Processing - Connectivity, Images-Gray Scale and Binary Images, Blob Filling, Thresholding, Histogram- Convolution - Digital Convolution and Filtering and Masking Techniques- Edge Detection - Mono and Stereo Vision.

Unit 3: Sensors and Sensing Devices

Introduction to various types of sensor- Resistive sensors. Range sensors - LADAR (Laser Distance and Ranging, Sonar, Radar and Infra-red- Introduction to sensing - Light sensing, Heat sensing, touch sensing and Position sensing.

Unit 4: PLC

Building blocks of automation, Controllers – PLC- Role of PLC in Robotics & FA -Architecture of PLC - Advantages - Types of PLC - Types of Programming - Simple process control programs using Relay Ladder Logic and Boolean logic methods - PLC arithmetic functions.

Unit 5: Factory Automation

Flexible Manufacturing Systems concept - Automatic feeding lines, ASRS, transfer lines, automatic inspection - Computer Integrated Manufacture - CNC, intelligent automation. Industrial networking, bus standards, HMI Systems, DCS and SCADA, Wireless controls. Inverse Kinematics - Geometric methods and Algebraic methods-SCARA robot - PUMA robot.

Text and Reference Books:

1. *Duda, Hart and Stork, Pattern Recognition, Wiley-Inter science, 2000.*
2. *Mallot, Computational Vision: Information Processing in Perception and Visual Behavior, Cambridge, 2000.*
3. *Stuart Russell and Peter Norvig, Artificial Intelligence-A Modern Approach, Pearson Education Series in Artificial Intelligence, 2004.*
4. *Robert Schilling and Craig, Fundamentals of Robotics: Analysis and Control, Hall ofIndia Private Limited, 2003.*
5. *Forsyth and Ponce, Computer Vision: A Modern Approach, Person Education, 2003.*
6. *Richard D Klafter, Thomas A Chmielewski, Michael Negin, Robotics Engineering – An Integrated Approach, Eastern Economy Edition, Prentice Hall of India P Ltd., 2006 Deb S R., Robotics Technology*

Semester – III *(Course Work)*
ESS-305E1: Soft Computing Techniques

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To expose the concepts of feed forward neural networks.*
- *To provide adequate knowledge about feedback neural networks.*
- *To teach about the concept of fuzziness involved in various systems.*
- *To expose the ideas about genetic algorithm.*
- *The student will be able to a) Apply derivative based and derivative free optimization, b) Demonstrate some applications of computational intelligence and c) Analyze and model computer systems specific problems, identify and define the appropriate requirements for their solutions.*

Unit 1: Introduction of Soft Computing

Introduction of soft computing - soft computing vs. hard computing- various types of soft computing techniques- applications of soft Computing-Neuron- Nerve structure and synapse- Artificial Neuron and its model- activation functions.

Unit 2: Introduction to Artificial Neural Networks

Neural network architecture- single layer and multilayer feed forward networks- McCullochPitts neuron model- perceptron model- Adaline and Madaline- multilayer perception model- back propagation learning methods- effect of learning rule coefficient - back propagation algorithm- factors affecting back propagation training – applications.

Unit 3: Artificial Neural Networks

Counter propagation network- architecture- functioning & characteristics of counter- Propagation Network-Hopfield/ Recurrent network- configuration- stability constraints associative memory- and characteristics-limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture-Classifications-Implementation and Training-Associative Memory.

Unit 4: Fuzzy Logic System

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modelling and control- Fuzzification- inferencing and de-fuzzification- Fuzzy knowledge and rule bases-Fuzzy modelling and control schemes for nonlinear systems. Self-organizing fuzzy logic control-Fuzzy logic control for nonlinear time delay system.

Unit 5: Genetic Algorithm

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters- Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems. Variants of Binary Encoded Genetic Algorithms: Micro Genetic Algorithm, Messy Genetic Algorithm, Greedy Genetic Algorithm etc. and their usage in Engineering Problems.

Text and Reference Books:

1. *Laurene V. Fausett, Fundamentals of Neural Networks: Architectures, Algorithms & Applications, Pearson Education, 2009*
2. *Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.2008*
3. *Zimmermann H.J. "Fuzzy set theory and its Applications" Springer international edition 2011.*
4. *David E.Goldberg, "Genetic Algorithms in Search, Optimization, and Machine*
5. *Learning", Pearson Education,2009.*
6. *W.T.Miller, R.S.Sutton & P.J.Webrose, "Neural Networks for Control", MIT Press, 1996.*

Semester – III (*Course Work*)

ESS-305E2: Digital Communication Techniques

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *Different types of Signals.*
- *Define different types of Digital Modulation Techniques.*
- *Correlation and Intersymbol Interference.*
- *To analyze error performance of a digital communication system in presence of noise and other interferences.*
- *Understand the behaviour of Band-limited Channels*

Unit 1: Introduction

Digital communication system (description of different modules of the block diagram), Complex baseband representation of signals, Gram-Schmidt orthogonalization procedure. M-ary orthogonal signals, bi-orthogonal signals, simplex signal waveforms.

Unit 2: Digital Modulation Techniques

Pulse amplitude modulation (binary and M-ary, QAM), Pulse position modulation (binary and M-ary), Carrier modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK).

Unit 3: Receiver in additive white Gaussian noise channels

Coherent and non-coherent demodulation: Matched filter, Correlator demodulator, square-law, and envelope detection; Detector: Optimum rule for ML and MAP detection Performance: Bit-error-rate, symbol error rate for coherent and non-coherent schemes.

Unit 4: Band-limited channels

Pulse shape design for channels with ISI: Nyquist pulse, Partial response signalling (duo-binary and modified duo binary pulses), demodulation; Channel with distortion: Design of transmitting and receiving filters for a known channel and for time varying channel (equalization); Performance: Symbol by symbol detection and BER, symbol and sequence detection, Viterbi algorithm.

Unit 5: Synchronization and Communication over Fading Channels

Different synchronization techniques (Early-Late Gate, MMSE, ML and spectral line methods). Characteristics of fading channels, Rayleigh and Rician channels, receiver performance-average SNR, outage probability, amount of fading and average bit/symbol error rate

Text and Reference Books:

1. *Digital Communication, Barry, John R., Lee, Edward A., Messerschmitt, David G. Springer.*
2. *Digital Communications, John G. Proakis, Masoud Salehi, 5th Edition, McGraw-Hill Education.*
3. *Digital Communications, Haykin, John Wiley and Sons.*
4. *Digital Communications, Fundamentals and Applications, Bernard Sklar, Prentice Hall Ltd*
5. *Introduction to Digital communications, Micheal. B. Pursley, prentice Hall Ltd.*

Semester – III (*Course Work*)
ESS-305E3: Automotive Embedded Electronics

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To gain knowledge about various parameters about the performance of Engine.*
- *To gain the knowledge of various Electronic control system used in the Automobiles.*
- *To be able to understand the state of the art technology used in the automobiles.*

Unit 1: Internal Combustion Engine Fundamentals

Engine types and their operations: Engine Operating Cycles, Engine Components, Spark-Ignition Engine Operation, Examples of Spark-Ignition Engines, Compression-Ignition Engine Operation, Engine parameters: Geometrical Properties of Reciprocating Engines, Brake Torque and Power, Indicated Work per Cycle, Mechanical Efficiency, Road-Load Power, Mean Effective Pressure, Specific Fuel Consumption and Efficiency, Air/Fuel and Fuel/Air Ratios, Thermo-chemistry of Air/fuel mixture: Ideal Gas Model, Composition of Air and Fuels, Combustion Stoichiometry.

Unit 2: Automotive Electronic Control Systems

Power train domain: Engine control unit, Electronic fuel injection control, Electronic ignition control, Chassis domain: ABS, ESP, EPS, Body domain: Doors, window lift, seat control, lighting, heating, ventilation and AC control, Automotive sensors and actuators required for above domains.

Unit 3: Automotive Networks

Automotive communication system: characteristics and constrains, In-car embedded networks review, Middleware, AUTOSAR, Issues for automotive communication system, Study of automotive communication standards: CAN, Flex-Ray, review of LIN bus.

Unit 4: Model Based Software Development

Product lines in automotive electronics, MBD for Automotive Embedded Systems, Context, Concerns, and Requirements, MBD Technology, State of the Art and Practice, Guidelines for Adopting MBD.

Unit 5: Testing Automotive Control Software

Test Activities and Testing Techniques, testing in the Development Process Test Planning Testing and Monitoring of Flex-Ray Based Applications, Objectives for Testing and Monitoring, Monitoring and Testing Approaches Discussion of Approaches.

Text and Reference Books:

1. *"Internal Combustion Engine Fundamentals", John B. L Heywood, Mc-GrawHill Inc.*
2. *"Automotive Embedded Systems Handbook", edited by Nicolas Navet , CRC press.*
3. *"Understanding Automotive Electronics", by Williams Ribbens, Elsevier Pub.*
4. *"Automotive Electronics Handbook", Ronald K. Jurgen Mc-GrawHill Inc.*
5. *"BOSCH CAN Specifications Version 2".*
6. *"Flex Ray and its Applications", Dominique Pret, Wiley Publication.*

Semester – III *(Course Work)*
ESS-305E4: RF Engineering

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
3	1	0	4	50	100	150	3 Hours

Learning Objectives

- *To learn working of various electronic components in radio frequency range.*
- *To design circuits and systems including communication circuits which can be operated in radio frequency range.*

Unit 1: RF Passive Components and Transmission Line Analysis

High frequency Resistors, Capacitors and Inductors – Transmission Line Analysis line equation –Micro stripe line – SWR voltage reflection co-efficient propagation constant, phase constant, phase velocity – smith chart – parallel RL and RC circuits ABCD parameters and S parameters.

Unit 2: RF Active Components and RF Amplifier Design

RF Diode: PIN diode - GUNN diode - RF bipolar junction transistor - RF field effect transistor - modeling of diode - transistor and FET; RF Amplifier: Characteristics – power relational and stability considerations - LNA - power amplifiers - differential amplifiers - distributed power amplifiers and broadband amplifiers.

Unit 3: RF Circuits Design

RF Oscillator Design: Fixed frequency oscillator - dielectric resonant oscillator – voltage controlled oscillator - sun element oscillator; RF Mixer Design: Single ended mixer – double ended mixer; RF Filter Resonator and Filter Configuration: Butterworth and Chebyshev filters - design of microstrip filters.

Unit 4: RF IC Design

Introduction to RFIC: Analog and microwave design versus RFIC design – noise performance estimation - RF technology - receiver with single IF stage metallization – sheet resistance - skin effect -parasitic capacitance and inductance - current handling – metal capacitors - spiral inductors - quality factor - layout in IC - mutual inductance - multilevel - measurement - packaging.

Unit 5: RF System Design

Link Design: Fading design - protected and non protected microwave systems – path calculation - spread spectrum microwave system - compatibility - safety coordinate systems - Datam's and GPS - receiver design - receiver architecture dynamic range – Frequency conversion and filtering; Examples of Practical Receivers: FM broadcast - digital cellular – multi-meter wave point to point - Direct conversion GSM receiver; RF MEMS: Concept - implementation and applications.

Text and Reference Books:

1. *David Pozar, "Microwave and RF design of Wireless systems," Johnwiley, 2008.*
2. *Joseph.J.Carr, "Secrets of RF circuit design," Tata McGraw Hill, 2004.*
3. *Reinhold Ludwig and PavelBretchko, "RF circuit design," Pearson Education, 2007.*
4. *Josn Rogers and Calvin Plett, "Radio frequency Integrated circuit design," Artech house, 2002.*
5. *VivekVaradhan," RF MEMS and their applications", Wiley Eastern edition, 2003.*
6. *FerriLosee, "RF systems, Components and Circuits handbook," Artech house, 2002.*

Semester – III *(Course Work)*

ESS-306L: Mixed Signal and DSP Systems Lab

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	4	70	80	150	3 Hours

List of Experiments

Experiments on Mixed Signal Systems

Design of following using in standard technology node

1. Current Mirrors.
2. Single stage amplifier
3. Source follower
4. Differential Amplifier
5. Gilbert Cell
6. Operational Amplifier
7. PLL
8. Bandgap Reference
9. Digital to Analog Converters
10. Analog to Digital Converters

Experiments on DSP

11. Write a program to implement convolution of x(n) with h(n) using linear convolution and verify the result y(n) as below. x(n) = [1,1,1,1,0.5,0.5,0.5,0.5] , h(n) = [0.3,0.25,0.2,0.15,0.1,0.05] and y(n) = [0.3, 0.55,0.75,0.9,0.85,0.775,0.675,0.6,0.4.0.25,0.15,0.075,0.025]
12. Write a program for circular convolution of the following inputs x(n) and h(n) and Verify the output y(n) as given below: x(n) = [1,1,1,2,1,1] , h(n) = [1,1,2,1] and y(n) = [6,5,5,6,6,7]
13. Implement an 8-point DFT for the inputs x(n) and verify the result as X(K). Where, x(n) = [1,1,1,1,1,1,0,0] and X(K) = [6,-0.707-j1.707,1-j,0.707+j0.293,0,0.707-j0.293,1+j,-0.707+j1.707].
14. Find IDFT of the sequence X(K) = [11110000]. Verify that x (n) = [0.5,0.125+j0.30175, 0,0.125+j0.05175, 0,0.125-j0.05175, 0,0.125-j0.30175]
15. Generate the following waveforms using TMS320XX DSP kit and verify the outputs for different frequencies (1KHz, 2KHz etc.) a) Sine wave, b) Square wave
16. Tone Generation using the DAC of TMS320XX DSP kit. a) Generate a simple tone of a fixed frequency (1 KHz), b) Generate multiple tones at frequencies starting from 300Hz to 3 KHz with an increment of 100Hz each tone for duration of 1second using timer interrupt.
17. Design an FIR Low pass Filter with following specification. fp = 1500Hz, fs = 2000Hz, Pass band attenuation = 0.01dB, Stop band attenuation = 40dB and Fs = 8000 Hz using Kaiser window.
18. Real-time Implementation of FIR filters: a) Generate the filter coefficients using Kaiser Window for a low pass FIR filter for the specification as given in experiment 1 of module 2, b) Apply an input signal through ADC and implement the filter on ARM Cortex M3/M4. Vary the input signal frequency and observe the output on an Oscilloscope, c) Repeat the filter for Band pass and High pass, d) Repeat the same with hamming window.
19. Perform FFT analysis for the signal input through ADC and display the input signal as well as the FFT output on PC using Probe point facility. Perform FFT operation for 16, 32 and 64-point FFT. Compute the power spectrum X(K) * X(K) = $|X(K)|^2 = Xreal^2 + Ximag^2$ and plot the same in PC.
20. DTMF Tone Generation and Detection and its implementation: a) Generate DTMF Tones. Detect the DTMF tone input trough the ADC, b) Implement the program with Geortzel algorithm.
21. Filter design using TMS Processor.

Semester – III *(Course Work)*

ESS-307P/I: Pre Project/Pre-Internship

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	1	6	4	70	80	150	3 Hours

Pre-Project Description

In the Pre-Project work, students shall choose a specific topic/area for their project. A supervisor will be assigned to each student, who at the beginning of the 3rd semester shall provide a syllabus and plan of study including relevant research papers to the student. Each student at the end of the course will submit a survey report regarding the final project and the same will be evaluated for final award of the course. Each Pre-Project work shall be evaluated for correctness, length and breadth of the background work undertaken by the student.

Pre-Internship Description

In Pre-Internship, students shall choose a specific domain for their Internship and identify prospective organizations and apply for Internship programmes. For Pre-Internship work, a counselor will be assigned to each student, who at the beginning of the 3rd semester shall guide him/her regarding identifying the prospective organizations and applying therein. At the successful completion of this course, students will: be able to articulate the mechanics of locating internships and behaving professionally; have produced the tools necessary to secure an appropriate internship; have created a professional portfolio that highlights their accomplishments. The student at the end of the course will submit a survey report regarding the procedure adopted and efforts made by the student in securing an Intern position and the same will be evaluated for final award of the course.

Semester – IV *(Internship)*

ESS-401I: Internship

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	0	48	24	200	700	900	3 Hours

Description

Internship shall be of six months (Minimum 18 weeks') duration and a student can accumulate 24 credits on successful completion of internship.

- Internships shall be considered as six months (not less than 18 weeks) of supervised learning carried out at industry or some academic institution of excellence. Students are encouraged to apply for internship in 3rd semester to companies or academic institutions so that its commencement is ensured at the beginning of 4th semester.
- The head of the Department and counsellor will collect a mid-term feedback to ensure smooth progress towards the completion of internship. At the time of completion of the internship, a certificate (satisfactory/unsatisfactory) and marks from concerned person of the organization shall be collected by the head of the Department. An Internship committee comprising of Head of the Department, External Expert, counsellor, and two faculty members of the department shall collect the report from the student and evaluate it. The certificate from the organization where internship was carried will be given due consideration. If the certificate is unsatisfactory then the Internship committee will review the matter and if they agree with the given certificate, the student has to carry on the internship again at same or different place.

Semester – IV (*Thesis*)

ESS-402T: Project and Thesis

Hours per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		Internal	End Term	Total	Hours
0	0	48	24	200	700	900	3 Hours

Description

Project and Thesis shall be of six months (Minimum 18 weeks') duration and a student can accumulate 24 credits on successful completion of Project. This is in addition to pre-project work in 3rd semester wherein students shall choose a specific topic/area for their project and undertake its study.

- A thesis committee comprising of the head of the Department, external expert, supervisor and at least two more faculty members will serve thesis and oral examiners for each student pursuing thesis.
- A soft copy of the thesis in .pdf format (in specific style) should be sent to thesis committee, before its final submission. The Thesis committee shall examine it for suitability of publication (including any possible plagiarism) before the thesis goes in print and for binding.
- The external marks of 700 shall be evaluated with a breakup 500 for viva-voce and evaluation of thesis/project and 200 for a publication/s in indexed journal/conference. The publication will be verified by the thesis committee on the day of viva-voce.
- The publication must be the sole work of the student. Further, for conference publication, the student should produce presentation certificate to the thesis committee.

Choice Based Credit System (CBCS)

Scheme for

M. Sc. Programme

in

ELECTRONICS

(APPROVED BY BOARD OF STUDIES HELD ON 16-12-2013)

Post Graduate
Department of Electronics & Instrumentation Technology
University of Kashmir
Hazratbal, Srinagar - 6, J & K

Course Layout
M. Sc. Programme in Electronics

SEMESTER I						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-14101C	Engineering Mathematics	Core	3	0	0	3
ELE-14102C	Circuit Analysis and Synthesis	Core	3	0	0	3
ELE-14103C	Antennas and Wave Propagation	Core	3	0	0	3
ELE-14104LC	Digital Electronics, Circuit Analysis and Antenna Lab	Core	0	0	6	3
ELE-14105A	Linear Integrated Circuits and Applications	AE	3	0	2	4
ELE-14106A	Programming and Problem Solving through C	AE	3	0	2	4
ELE-14107A	Windows Programming	AE	3	0	2	4
ELE-14108A	Instrument Fabrication and Maintenance	AE	3	0	2	4
ELE-14109A	Numerical Techniques and FORTRAN Programming	AE	3	0	2	4
ELE-14110A	Electronics Engineering Materials & Components	AE	4	0	0	4
ELE-14111O	Computing and Informatics-I	OE	1	2	0	2

AE: Allied Elective
OE: Open Elective

Total Core Credits offered: 12.
Minimum Allied Elective Credits to be offered: 12

Course Layout
M. Sc. Programme in Electronics

SEMESTER II						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-14201C	Analog Communication Systems	Core	3	0	0	3
ELE-14202C	Electronic Instrumentation	Core	3	0	0	3
ELE-14203C	Power Electronic Circuits and Systems	Core	3	0	0	3
ELE-14204LC	Analog Communication, Power Electronics and Instrumentation Lab	Core	0	0	6	3
ELE-14205A	Computer Organization and Architecture	AE	3	0	2	4
ELE-14206A	Design and Analysis of Active Filters	AE	3	0	2	4
ELE-14207A	Fiber Optic Communication	AE	3	0	2	4
ELE-14208A	Microwave Engineering	AE	3	0	2	4
ELE-14209A	Data Structures	AE	3	0	2	4
ELE-14210A	Operating Systems	AE	3	0	2	4
ELE-14211O	Computing and Informatics-II	OE	1	2	0	2

AE: Allied Elective
OE: Open Elective

Total Core Credits offered: 12.
Minimum Allied Elective Credits to be offered: 12

Course Layout
M. Sc. Programme in Electronics

SEMESTER III						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-14301C	Physics of Semiconductor Devices	Core	3	0	0	3
ELE-14302C	Control System Engineering	Core	3	0	0	3
ELE-14303C	Microprocessors: Architecture, Programming and Interfacing	Core	3	0	0	3
ELE-14304LC	Microprocessor and Control Lab	Core	0	0	6	3
ELE-14305A	Data Communication and Networking	AE	3	0	2	4
ELE-14306A	Digital Signal Processing	AE	3	0	2	4
ELE-14307A	HDL and Digital System Design	AE	3	0	2	4
ELE-14308A	Microcontrollers and Embedded Systems	AE	3	0	2	4
ELE-14309A	Biomedical Instrumentation	AE	3	0	2	4
ELE-14310A	Soft Computing and Neural Networks	AE	3	0	2	4
ELE-14311A	Advanced Communication Systems	AE	3	0	2	4
ELE-14312A	Fundamentals of RF design	AE	3	0	2	4
ELE-14313A	Speech and Audio Processing	AE	3	0	2	4
ELE-14314A	Digital CMOS IC Design	AE	3	0	2	4
ELE-14315O	Basic Electronic Science and Applications	OE	1		2	2

AE: Allied Elective
OE: Open Elective

Total Core Credits offered: 12.
Minimum Allied Elective Credits to be offered: 12

Course Layout
M. Sc. Programme in Electronics

SEMESTER IV						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-14401C	Digital Communication and Information Theory	Core	3	0	2	4
ELE-14402C	VLSI Technology	Core	3	0	0	3
ELE-14403C	Industrial Organization and Technopreneurship Development	Core	2	0	0	2
ELE-14404C	Project Work	Core	0	0	8	4
ELE-14405TC	Industrial Training	Core	0	0	2	1
ELE-14406A	CMOS Circuit Design: Analog and Mixed	AE	3	0	2	4
ELE-14407A	Information Security	AE	3	0	2	4
ELE-14408A	Nanotechnology	AE	3	0	2	4
ELE-14409A	Mobile Communication	AE	3	0	2	4
ELE-14410A	Advanced Microprocessors	AE	3	0	2	4
ELE-14411A	Analytical Instrumentation	AE	3	0	2	4
ELE-14412A	Digital Image Processing	AE	3	0	2	4
ELE-14413A	Parallel Computation and Architecture	AE	4	0	0	4
ELE-14414A	Multimedia Systems	AE	3	0	2	4

AE: Allied Elective
OE: Open Elective

Total Core Credits offered: 14.
Minimum Allied Elective Credits to be offered: 12

ELE-14404: Project Work

Each student group should complete the Project Work in IVth Semester under the supervision of an internal guide. The students are expected to prepare a Project Report on the Hardware/Software project, which shall be evaluated by the internal guide as well as an external Examiner as partial fulfillment of the degree of M.Sc. (Electronics).

ELE-14405TC: Industrial Training

The students are required to undergo training at some centre of excellence, outside the State, to get additional exposure in the new and emerging trends in the discipline of Electronics. A Training Incharge from the Department shall accompany the students for making necessary academic and other arrangements at the host institute. The performance of the students shall be evaluated by the host institute in collaboration with the Training Incharge.

Course No.: ELE-14101C **Engineering Mathematics**
Paper Type: Core **Credits: 3L+0T+0P**

Unit I: Fourier Transform

Dirichlet's Condition, Determination of Fourier Coefficients, Fourier Series for arbitrary period, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals, Fourier Transforms: Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit II: Laplace Transformation

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform in Electrical Networks.

Unit III: Function of Complex Variable

Analyticity of Complex variables, Cauchy Riemann Conditions, Cauchy integral Theorem, Laurent's Series, Singularities, Poles, Residues, Residue Theorem, Contour integration for Trigonometric functions (0 to 2□) , Contour Integration for functions ($-\infty$ to $+\infty$), Application of Functions of Complex variables in System Stability. Bessel and Legender Polynomials.

Text Books:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.

References:

1. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A. Fairley, John Wiley & Sons
2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.
3. Statistical Methods by S. P. Gupta, S Chand and Company.
4. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH
5. Fourier Transformation and Laplace Transformations, Schaum Series Book , TMHCourse

Course No.: ELE-14102C **Circuit Analysis and Synthesis**
Paper type: Core **Credits: 3L+0T+0P**

Unit I: Graph Theory and Network Equations

Introduction to Graph Theory: Nodes, Branches, Graph and Sub-Graph, Path, Loop, Tree, Link and Twig, Isomorphism, Network Matrices, Incidence Matrix, Loop Matrix, Fundamental Loop, Cut - Set Matrix, Fundamental Cut Set, Relationship between Matrices, Formulation of Network Equations on the Loop and Node pair voltage bases, Fundamental Loop Mesh Equations, Nodal equations, Nodal Admittance, Source Transformations, Tellegen"s Theorem and its Applications.

Unit II Two Port Networks and Network Functions

Two port networks, Various Two Port parameters, O. C. Impedance and S. C. Admittance Parameters, parameters, chain Parameters, Image Impedance, Applications of various Two port Parameters to T and π networks, Relationship between different two port parameters, Interconnection of Two port equivalent networks, Indefinite Admittance Matrix. Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Poles, Zeros and Frequency response, Physical interpretation of Poles and Zeros, Oscillatory response of Poles and Zeros

Unit III: State Space Analysis and Passive Network Synthesis

Basic consideration in writing state variable equations for electrical Network, Formulation of state equations for Electrical Networks and their solutions.

Introduction to passive network synthesis, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immittance Functions *(realized by Foster-I and Foster II form, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC Admittance Functions.

Recommended Books:

1. Networks and Systems by D.R.Choudury, Wiley Eastern Ltd: New Delhi.
2. Network Analysis By M. E. Valkenburg , Prentice Hall India.
3. Basic Circuit Theory by Charles A. Desoer and Ernest S. Kun, McGraw Hill
4. Circuit Analysis with Computer Application to Problem Solving by Gupta, Bayless and Piekari, Willey Eastern Ltd, New Delhi

Course No.: ELE-14103C **Antennas and Wave Propagation**
Paper Type: Core **Credit: 3L+0T+0P**

Credit- 1 Maxwell's Equations

Review of Electromagnetics and EM spectrum, Basic quantities of Electromagnetics, Basic laws of electromagnetism, Transformer and Motional Electromotive forces, Maxwell"s Equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Displacement current (Physical interpretations), Time varying field equations Boundary condition, Surface Charge and Surface Current, Boundary Conditions at media interface (Dielectric and Conducting interface)

Credit- II Electromagnetic Waves

Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, wave propagation in conducting medium, power flow and pointing vector (Physical interpretation), plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface.

Credit- III Antenna Radiation Mechanism

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna

Credit- IV Practical Antennas

Folded dipole antennas, modification of folded dioples, loop antennas, far- field patterns of circular loop antennas, horn antennas, reactangular horn antennas, the paraboloidal reflector, spherical reflector, introduction to microstrip antennas, some salient features of microstrip antennas, rectangular microstrip antennas, applications of microstrip antennas

Referances:

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition

2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill

Course No.: ELE-14104LC: Digital Electronics, Circuit Analysis and Antenna Lab
Paper type: Core Credits: 0L+0T+6P

Digital Electronics

Implementation and verification of truth table of logic gates; Study Half/Full Adder/Subtractor. Excess-3 to BCD Converter; Binary-to-Grey Converter; MUX/DMUX; Comparators; Encoder/Decoder; Flip-Flops; Shift Registers/Counters; Jhonson/Ring Counter; Multivibrators.

Circuit Analysis

Find the branch currents and branch voltages of:
A given network using mesh analysis and compare them with the theoretical values;
A given network using node analysis and compare them with the theoretical values.

For a T and Π network find open circuit and short circuit parameters and Verify that the overall ABCD parameters of a cascade of two networks are equal to the sum of individual ABCD parameters. Study the pole-zero response of a network function using Matlab. Study the effect of the variation in poles and zeros on the frequency response of a network function.

Antennas

To study:
The directional properties of Hertz Antenna; directivity, gain and effective aperture of Antenna systems; the Polarization properties of directional antennas;

To simulate antenna system using simulation software.

To perform experiments on microwave antenna system

Course No. ELE-14105A **Linear Integrated Circuits and Applications**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Operational Amplifier Applications

Review of Op-amps, Linear Applications of Op-amps: Amplification (Inverting Amplifier, Non-inverting Amplifier, Logarithmic and Exponential Amplifiers, Instrumentation Amplifier) Integration and Differentiation; Op-amp based Active filter design, Analog multiplexer and Voltage-to-Frequency and Frequency-to-Voltage Converters, Frequency response of OP-Amps

Unit II: Wave shaping, Wave generators and Data Converters
Rectifiers, Clippers and Clampers, Peak Detector, Comparators, Applications of comparators, Schmitt-trigger, Square wave and triangular wave generators, pulse generators, voltage time-base generators, Step (Stair-case) generators, sinusoidal generators: Phase shift oscillator, Wien-bridge oscillator, Sample and hold systems, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation)

Unit III: Timer, PLL and Voltage Regulators
555 timer: Applications as Astable and Monostable Multivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, PLL motor speed control, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Unit IV: Practicals

To study and/or design op-amp: Inverting Amplifier, Non-inverting Amplifier, Logarithmic and Exponential Amplifiers, Instrumentation Amplifier, Active filters, Analog multiplexer, Voltage-to-Frequency and Frequency-to-Voltage Converters, Frequency response, Rectifiers, Clippers and Clampers, Peak Detector, Schmitt-trigger, Square wave and triangular wave generators, Square wave and triangular wave generators,

Phase shift oscillator, Wien-bridge oscillator, Sample and hold system, Weighted Resistor and R-2R Ladder Network type DAC, Flash and Successive Approximation type ADC.

Books Recommended

1. *Integrated Electronics By Milliman, McGraw hill Book company*
2. *Microelectronics By Milliman and Grabel, McGraw Hill Company*
3. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, Mc-Graw Hill, 2002.
4. *OP- Amp and Linear Integreated Circuits by R. A. Gayakward Prentice Hall of India Ltd.*

Course No.: ELE-14106A **Programming and Problem Solving through C**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Introduction to Programming
Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation, Introduction to „C‟Language - Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple „C‟ programs , Conditional Statements and Loops - Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.

Unit II: Arrays and Functions
Arrays - One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices, Functions - Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments

Unit III: Structures, Pointers and Files
Structures and Unions- Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Pointers- Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays. File Processing - Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file.

Unit IV: Practicals
Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate „sin x‟ as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluation of Polynomials, programs using structures and pointers, File processing, programs for solving engineering problems.

Recommended Books:
1. P.K. Sinha and P. Sinha, “Foundation of Computers” BPB Publishers
2. Turban, Mclear and Wetherbe ,"Information Technology and Management"
3. Byron Gottfried "Programming with C"
4. R.G. Dromey, "How to solve it by Computer"
5. E.Balaguruswamy, "Programming with ANSI-C"
6. A.Kamthane, "Programming with ANSI & Turbo C"
7. Dietel “Programming with C”

Course No.: ELE-14107A **Windows Programming**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Dot-Net Architecture

DOT NET framework, MSIL, CLR, CLS, Name spaces, Assemblies Common Language Implementation Assemblies Metadata and Intermediate Language. Garbage Collection Versioning and Side-by-Side Execution. Integration Development Environment of VB, User Interface, Designing, Basics of Event driven programming. From- Designing, Showing & Hiding.

Unit II: Windows Programming Foundations
VB language- Data types, Variables & Constant, Arrays, Function, Collections, Procedures, Arguments passing, Control Flow statements: if- then, if-then-else, select case, looping statement: Do-loop, For-next, While-Wend, Nested Control Structure, Exit statement. Intrinsic and Active X Controls, Properties & Methods – Text box, List box, combo box, Scrollbar, slider Controls. Advance Active X Control – Common Dialog controls, Color, Font, File open, file save using Rich Textbox Controls. String Manipulations on Textboxes. Graphics controls – Picture Box, Coordinate system, Graphics Methods- Text drawing, Lines & Shape, Filling Shapes.

Unit III: Advanced Windows Programming
Grid methods Menu editor: Pull-down, Pop-up Menus. Multiple Document Interface- Parent & Child Forms & Methods. OLE – Basics, OLE control Properties & Methods, Error handling in VB- Types of Errors, Error handling methods and functions. Database Programming with VB database Models, Visual Data manager, DATA Control- Methods, Properties, Connectivity with database, DATA bound controls, ADO Database Controls, Creating & using Database with object model, Attaching Queries with database. Filtering Data. DATA Report Designer.

Unit IV: Practicals

Programming exercises using VB.NET for problem solving involving use of arrays, collections, procedures, control flow, intrinsic and active-x controls, files, SDI and MDI interfaces and databases.

Recommended Books:

1. Mastering VB .NET by Evangelos Peteroutsos, WROX Publications
2. Dietel and Dietel, "Visual Basic, How to Program", Pearson Education.
3. Peter Norton"s Guide To Visual Basic 6 By Peter Norton
4. Beginning Visual Basic 6 By Peter Wright, Shroff Publishers
5. Programming In Visual Basic 6.0 By Mohammed Azam, Vikas Publishing House

Course No.: ELE-14108A **INSTRUMENT FABRICATION AND MAINTENANCE**

Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit-I: Transformers, UPS and Batteries

Transformers: Single-Phase Transformers, Construction, Types, Transformer ratio, Cooling, Auto Transformer, Transformer Tests, Efficiency of Transformer, Transformer winding, autocuts and line protection. Three phase transformers - connections, parallel operation. Fabrication and repairs of Transformers. UPS: Principle and operation, performance parameters, capacity, Repairs of UPS.

Rechargeable Batteries: Principle, types, capacity, AH rating. Fabrication and repairs of batteries.

Unit-II: Generators, Motors and other Appliances:

DC/AC Generators: Magnetic induction, Principle, Torque Equation, Main Parts, Types, Application. Motor Winding, Fan Winding, Repairs of DC/AC Motors, Generators & Fans. Repairs of Xerox Machines, FAX Machines &Telephone equipment. Repairs of Washing Machines.

Unit-III: Assembling and maintenance of Computers & Mobile Phones

Assembling of a computer system, Hardware maintenance of a computer system, memory upgradation, software faults. Maintenance of printers and other computer accessories. **Mobile phones:** Computerized Chip Level Mobile Repairing, IC Replacement and Rebolling, methods of Flashing, Mobile Unlocking, Mobile Formatting, UI Settings. Mobile Downloading, Blue-Tooth & Card-Reader Cables.

Unit-IV: Practicals on equipment Maintenance

Practical exercises on fabrication of power transformers, transformer winding, UPS assembling, repairs of Xerox machines, Fax machines. Practical exercises on repairs of mobile phones.

Assembling of computer system and memory upgradation.

Course No.: ELE-14109A **Numerical Techniques and FORTRAN programming**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

UNIT I: Roots of Equations, System of Equations and Curve fitting
Approximation Methods and Errors: Accuracy and precision, Truncation and round-off errors. Roots of Equations: Bracketing Methods (false position, bisection), Iteration Methods (Newton-Raphson Method). Systems of linear algebraic equations: Gauss‟s Elimination Method; Curve fitting: Least squares regression, Linear, multiple linear and nonlinear regressions, Cubic spline.

UNIT II: Interpolation, Differentiation and Integration
Interpolation Methods: Newton‟s divided difference and Lagrange interpolating polynomials. Numerical differentiation and integration: Divided difference method for differentiation, Newton-Cotes formula, Trapezoidal and Simpson‟s rules. Ordinary differential equations: Euler‟s method and its modifications, Runge-Kutta methods, Boundary value and Eigen value problems.

UNIT III: FORTRAN Programming
Formatting source codes. Data types. Constants, variables, arrays, indices. Expressions, operators, operands. Standard and statement functions. Rules for expression evaluation, priorities of operators. Cycles, statements, constructs.
Type declaration, array declaration, definition of named constants, data initialization, memory sharing, retaining local variables. Assignments, goto statements, conditional statements, cycle statements, empty statement, stopping and pausing, return from a unit. Subroutines, functions, data subprograms.

UNIT IV: Practicals
FORTRAN programs for evaluation of polynomials and matrices.
FORTRAN programs for numerical techniques: False position method, Bisection method, Newton-Raphson Method, Gauss‟s elimination Method, Least squares regression, Lagrange interpolating polynomials, Trapezoidal and Simpson‟s rules, Euler‟s method and Runge-Kutta methods

Books Recommended
1. Numerical Mathematical Analysis, J.B. Scarborough, John Hopkins (1966).
2. Introductory Methods of Numerical Analysis, S.S. Sastry, Prentice Hall of India (1983)
3. Numerical Methods for Engineering, S.C. Chapra and R.C. Canale, McGraw-Hill (1989).
4. W.H. Press, S.A. Teukolsky, W.T. Vetterling, B.P. Flannery, Numerical Recipes in Fortran 77: The Art of Scientific Computing, Second Edition, Cambridge University Press, 1996.

Course No.: ELE-14110A **Electronic Engineering Materials & Components**
Paper Type: Allied Elective **Credits: 4L + 0T + 0P**

UNIT-I Electrical Properties of Materials
Classification of electrical materials; Fundamentals of Atomic Structure and Chemical Bonding; Structure and properties of conductors, semi-conductors and insulators;

UNIT-II Magnetic Properties of Materials
S and properties of magnetic materials, ferroelectric, piezo-electric, ceramic optical and superconducting materials.

Structure of solids : Crystalline and Non-crystalline states; Crystallographic directions and phases; Determination of crystal
structures.

UNIT-III Electronic Components
Passive components; Resistors, capacitors, inductors and their types; color coding; ferrites, Quartz crystal and ceramic resonators, electromagnetic and electromechanical components.

UNIT IV Physical Electronics
Electrons and holes in semiconductors; Hall effect; mechanism of current flow in a semi-conductor, junction theory, different types of diodes and their characteristics (rectifying, Zener, LED, Photo). Introduction to three terminal devices (BJT and FET).

Books Recommended:

1. Electronic Devices and Circuit Theory. By: Robert Boylestad & Louis Nashelsky. Prentice Hall.
2. Elements of Materials Science & Engineering. By: L.H. Van Vlack. Addison-Wesley Publishing Company, New York.

Course No.: ELE-14112O **Computing & Informatics-I**
Paper Type: Open Elective **Credits: 1L + 1T + 0P**

Unit I: (Theory)

Computer basics. History, generations and classification of computers; Number systems; Hardware. Components of a computer input/output devices, CPU unit and memory unit, secondary storage. Software, System software; application software; compilers and translators. Operating systems. Introduction to operating systems;' types of operating systems and their functions; popular operating systems- Linux, UNIX and Windows, Introduction to office automation and Internet.

Unit II: (Tutorial)

Identification of various internal and external parts of computer system, connecting various parts of computer system, learning basic commands for file management on windows operating system, learning to create, format and print documents, spreadsheets and presentations, using Internet.

Recommended Books:

1. V. Srivastava “Computing and Informatics” Ist Edition S. K. Kataria & Sons.
2. Chandwani “Computing and Informatics” Jain Brothers.
3. Anital Goel “Computer Fundamentals” Pearson
4. P.K.Sinha “Computer Fundamentals” BPB Publications.

Course No.: ELE- 14201C **Analog Communication Systems**
Paper Type: Core **Credit: 3L+0T+0P**

Unit I- Amplitude Modulation/Demodulation Techniques

Introduction to Signals and its classification**,** Properties of Signals and Noise,**:** Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of Amplitude Modulation, Double Side band Suppressed Carrier, (DSB- SC) System: Mathematical Analysis, Generation and Demodulation of DSB- SC signals, Costas receiver. Advantages of SSB transmission, Hilbert Transform, properties of Hilbert transform, pplications of Hilbert Transform, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and receiption

Unit II- FM Modulation/ Reception

Concept of Angle Modulation: Mathematical theory, Phasor Representation of Angle modulated signal, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission. FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, Foster Selay or Phase Discriminator, FM Detector using PLL and Stereo FM Multiplex Reception.

Unit III Performance of Analog Communication Systems

Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise equivalent Band-width, Effective Noise temperature, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Books Recommended:

1. Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.

2. George Kennedy, “Electronic Communication System”, McGraw- Hill.

3. Gary M. Miller and Jeffery S. Beasley, “Modern Electronic Communications “, PHI.

4. Simon Haykin, “ Communication Systems”, 8th edition, Wiley Pubclishers.

5. Wayne Tomasi, “ Electronics Communication systems”, 4th edition, Pearson Publishers.

Course No.: ELE-14202C **Electronic Instrumentation**
Paper Type: Core **Credits: 3L + 0T + 0P**

Unit I: Measurements and Instrumentation

Fundamentals of Measurements: General Concepts on Instruments; Introduction to Portable Instruments; Errors and; Controlling and Networking of Instruments; Signals and Signal Conditioning; Noise and Interference

Transducers: Classification of transducers, characteristics and choice of transducers; Resistance, Capacitance, Peizoelectric, Thermoelectric, Hall effect, Photoelectric, Techogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed, and sound, temperature, pressure, flow, humidity, thickness, pH, position.

Unit II: Digital Measurements

Counters, Digital frequency meters and time meters, Universal counter timer. Digital Voltmeter: General Characteristics, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Integrating type DVM Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter, Digital tan delta meter, Digital IC tester.

Unit III: Measurement Instruments

Oscilloscopes: The basic operation of an oscilloscope, advanced techniques: Multiple time bases, Oscilloscopes with dual channels and dual time bases, Use of low cost microprocessor blocks, Digital storage oscilloscopes (DSOs): Sampling techniques, DSO characteristics, Recent developments on DSO techniques

Spectrum analyzers: Spectrum Analysis, Types of spectrum analyzer: Real time technique, Fourier transform analyzer, swept tuned analyzer, Superheterodyne spectrum analyzer

Books Recommended

01. *Digital and Analogue Instrumentation testing and measurement, Nihal Kularatna, The Institution of Electrical Engineers, 2003*
02. *Measurement, Instrumentation and Sensors Handbook, J. G. Webster, CRC Press, 1999.*
03. *Digital Measurement Techniques by T. S. Rathore, Narosa Publishing House, New Delhi.*

Course No.: ELE-14203C **Power Electronic Circuits and Systems**
Paper type: Core **Credits: 3L+0T+0P**

Unit I: Power Devices

Review of switching characteristics of semiconductor devices *(Power diodes, BJT's,),* Characteristics of an ideal switch, Types of electronic switches. Thyristor construction and characteristics, Methods of turning ON, Turn-off mechanism, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC and UJT V-I characteristics.

Unit II: Thyristor Circuits and Applications

Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Commutation techniques: Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit III: Switch Mode DC to DC Power Converters

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Half-Bridge converter, Push Pull converter and Full Bridge converter.

Unit IV: Inverters and Cyclo-converters

Inverter: Principle of operation, performance parameters, Pulse width modulation techniques, Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down , design of single-phase step down Cycloconverters , Power supplies: SMPS, UPS.

Recommended Books:
1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.
3. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.

Course No.: ELE-14204LC **Analog Communication, Power Electronics and Instrumentation Laboratory**

Paper type: Core **Credits: 0L+0T+6P**

Anolog Communication

To study analog Multiplier (AD633). Design and simulate AM modulator/Demodulator. Design and Simulate Frequency modulation/Demodulation. To study of PLL and detection of FM signal using PLL. Generation & simulation of DSB-SC and SSB signal. To Implement and Simulate Hilbert Transformer. Measurement of Noise Figure using a Noise generator. Study the functioning of super heterodyne AM receiver. Measurement of Sensitivity, Selectivity and Fidelity of radio receivers. Noise power spectral density measurement.

Power Electronics:

Study switching characteristics of Power transistors and power MOSFETs. To study IV characteristics of SCR and find its break over voltage on state resistance, holding current and latching current. To study IV Characteristics of DIAC and find its break over voltage. To study IV Characteristics of TRIAC and UJT. To design and realize UJT relaxation oscillator. Thyristor triggering circuits: and HW/FW controlled rectifiers using SCR. To study AC voltage control using DIAC TRIAC combinations. To study self commutation of SCR. To design and realize step up and step down chopper, buck Regulator, Boost Regulator and Buck-Boost Regulator.

Instrumentation:

Study of: Analog and Digital Oscilloscopes, Spectrum Analyzers Study characteristics of: Resistive, Capacitive, Peizoelectric transducers. Measurement of physical parameters using transducers. Study and Design: Digital frequency meter and time meter, Universal counter timer, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter

Course No.: ELE-14205A **Computer Organization and Architecture**
Paper Type: Allied Elective ***Credits: 3L + 0T + 2P***

Unit I: Structure, Function, Measuring Performance and Memory

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl‟s and Moore‟s Laws. Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence. Introduction to Virtual Memory, Overlays, Paging, Segmentation, Fragmentation, RAID and CAM.

Unit II: Instruction Set Architecture, Register Set and I/O Organization

Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes, CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register Transfer, Bus and Memory Transfer, Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic, logical and shift units, Micro-operations and instruction execution, I/O Organization – I/O Module, its functions and structure, I/O Techniques, Introduction to I/O Interfaces

Unit III: Data Representation, ALU and Control Unit Design (Theory)

Scalar Data Types Sign Magnitude, One‟s and Two‟s Complement representations of Integers, Integer Arithmetic‟s (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic‟s (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals, hardware and Micro-programmed /Wilkes Control unit, Micro-instructions and its formats, Control Memory. Introduction to Pipelining and Parallel Processing.

Unit IV: Practicals

Digital design of binary adders, subtractors, comparators, fast adders, etc. Chip implementation of various arithmetical and logical circuits, Design of 4/8 bit ALU. Study of Booths algorithm and its hardware implementation, understanding format and representation of various data types in High and low level languages, Design of a floating point adder.

Recommended Books:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India
5. Computer Organization by J. P. Hayes. Tata McGraw Hill.

Course No.: ELE-14206A **Design and Analysis of Active Filters**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Filter Approximation Models and Sensitivity analysis
Introduction to Analog filter theory, filter approximations, Butterworth approximation, Chebyshev approximation, Bessel filters, frequency transformations, low pass-lowpass, low pass-highpass, lowpass-bandpass and low pass to band reject transformations, Sensitivity study, Sensitivity function, magnitude and pass sensitivities, single parameter sensitivity, multiple parameter sensitivity.

Unit II: Active filter synthesis and Operational Transconductance Amplifier
Cascade approach, Simulated Inductance Approach, Operational Simulation of LC ladders and FDNR approach. Immitance converters and inverters, Generalized Impedance converter. Operational Transconductance Amplifier (OTA), Circuit Description of OTA, Advantages, limitations. Elementary Transconductor Building Blocks: Resistor, Integrator, Amplifier, summers, gyrators and Modulators. First and Second order Filters, High-order filters.

Unit III: Switched Capacitor filters
The MOS switch, The Switched capacitor/resistor equivalence, analysis of switched capacitor filter using charge conservation equations, First-order building blocks (Inverting and Non-inverting Amplifier, Integrator and Differentiator), Sampled-Data operation, Switched capacitor First and Second order Filters, Switched capacitor High-order filters.

Unit IV: Practicals
Study of CA3080 OTA chip, Design OTA based: Voltage amplifier (I & NI), Simulated Resistor (Grounded & Floating), Simulated Inductor (Grounded & Floating), Amplifier summer, Integrator (I & NI), Differentiation (I & NI), Gyrator; Design of OTA based low and high order fitters. Designs an OP-amp based GIC and verify it for inductor simulation, Design LC Ladder based 2nd order LP/HP/BP/BS filtering function using FDNR approach, Study the transformation of a given filtering function into the remaining filtering functions & verify them by using theoretical transformations, Design a simulated resistor of a given value using switched capacitor fitter, Design of Switche capacitor building blocks (Inverting and Non-inverting amplifier, Integrator and Differentiator), Design 1st order 2nd order filtering functions using SCF.

Books Recommended

1. *Analog Filters, Second Edition, Kendall Su, Kluwer Academic Publishers, 2002*
2. *Design and Analysis of Analog Filters: A Signal Processing Perspectiv, Larry D. Paarmann, Kluwer Academic Publishers, 2003*
3. *Analog Filter Design, M. E. van Valkenburg and Rolf Schumann, Oxford University Press, 2005.*
4. *Demystifying Switched-Capacitor Circuits, Mingliang Liu, Newnes, Elsevier, 2006.*

Course No.: ELE- 14311A: **Optical Fibre Communication**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit–I: Optical Fiber: Structures and propagation

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, different types of fibers, optical fiber modes and configurations, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED‟s and lasers, light sourse linearity, reliability consideration

Unit- II Digital and Analog links

Point to point links, power links, error control, coherent detection, differential quadrature phase shift keying (QPSK), overview of analog links, carrier- to- noise ratio, multichannel transmission techniques, RF over fiber, radio over fiber links

Unit- III WDM and Optical Networks

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, SONET/ SDH, high speed lightwave links, optical Add/Drop multiplexing, optical switching, WDM examples, passive optical networks, IP over DWDM, Optical ethernet Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers. Optical system design Considerations, Component choice

Unit- IV Practicals

To perform various experiments using OFC training kit, Multiplexing, Point-to- point links, System considerations, Overall fiber dispersion in Multi mode and Single mode fibers, Transmission distance, Line coding in Optical links, Measurement of Attenuation and Dispersion, Eye pattern.

Test Books and References:

1. Microwave Principles by Herbert J. Reich, East- West Press.

2. Antenna and Wave Propagation by A.K. Gautam.

3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.

4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Course No.: ELE-14208A **Microwave Engineering**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit I: Microwave Transmission Lines

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Standing wave and Standing wave ratio, Impedance matching by Stubs and Tapped Quarter wave line-transformer, Short circuited line, Open circuited line, Line terminated by arbitrary load.

Unit –II Micro wave Waveguides and Components

Fundamentals of Microwave Waveguides, Rectangular Waveguides, TE & TM modes in Rectangular magnitudes, excitation of modes in Rectangular Wave guides, Degenerative & dominant modes, S-Parameters: Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee , Magic tee, hybrid rings (rat-race circuits), directional Couplers, S-Matrix of direction Coupler, Circulators and isolators.

Unit III: Microwave Amplifiers & Oscillators

Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation, Microwave Cavity Resonators, Klystrons: Multicavity Klystron and Reflex Klystron, Magnetron oscillator (cylindrical), Gunn Oscillator, Parametric amplifier, Introduction to Strip lines: Micro strip and Parallel Strip lines.

Unit IV: Microwave Devices

To study VI characteristics of Gunn diode, To determine the frequency and wavelength in a rectangular wave guide working on TE 10 mode, To determine the standing wave ratio and reflection coefficient, To study functioning and behavior of Isolator, E-Plane Tee, H-Plane Tee, Magic tee, Study of characteristics of Klystron tube and to determine its electronic tuning range.

Text Books:

1. Microwave Devices and circuits by Samuel Y. Liao

2. Microwave Principles By Herbert J. Reich

3. Foundations for Microwave engineering by Robert E. Collin

4. Elements of Engineering Electromagnetics by Nannapaneni Narayana Rao

5. Electromagnetic Field theory by Rishabh Anand

Course No.: ELE-14209A **Data Structures**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Lists, Stacks & Queues

Lists, Abstract Data Type-List, Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked - Implementation and Applications. Stacks, Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Applications. Queues, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of de-queue, Array Implementation of a de-queue, Linked List Implementation of a de-queue.

Unit II: Trees & Graph Algorithms

Trees, Abstract Data Type-Tree, Tree Traversals, Binary Trees, Binary Tree Traversals, Recursive Binary Tree Traversals, Non Recursive Binary Tree Traversals, Applications. Binary Search Trees, Traversing a Binary Search Trees, Insertion of a node into a Binary Search Tree, Deletion of a node from a Binary Search Tree, AVL Trees, Insertion of a node into an AVL Tree, Deletion of a node from and AVL Tree, AVL tree rotations, Applications of AVL Trees, B-Trees, Operations on B-Trees ,Applications of B-Trees. Graphs Definitions, Shortest Path Algorithms, Dijkstra‟s Algorithm, Graphs with Negative Edge costs, Acyclic Graphs, All Pairs Shortest Paths Algorithm, Minimum cost Spanning Trees, Kruskal‟s Algorithm, Prims‟s Algorithm, Applications, Breadth First Search, Depth First Search, Finding Strongly Connected Components.

Unit III: Searching, Sorting and Advanced Data Structures

Linear Search, Binary Search, Applications. Internal Sorting, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sot, Heap Sort, Sorting on Several Keys. Splay Trees, Splaying steps, Splaying Algorithm, Red-Black trees, Properties of a Red Black tree, Insertion into a Red-Black tree, Deletion from a Red-Black tree, AA-Trees.

Unit IV: Practicals

Design, Implementation and tests of lists, Linked Lists, Stacks, Queues, Trees (Binary Tree, Recursive Implementation of Binary Tree Traversals, Non Recursive Implementations of Binary Tree Traversals, Applications.), Advanced Trees, Graphs, Searching, Sorting Techniques.

Recommended Books:

1. E. Balaguruswami “Data Structures through C” 1st Edition, Tata McGraw Hill.
2. Seymour Lipschutz “Data Structures with C” Schaum‟s Outline Series
3. S. K. Srivastava “Data Structures through C in Depth”, BPB Publication.
4. Reema Thareja“Data Structures using C”, Oxford P
5. R. B. Patel “Expert Data Structures with C” Khanna Publication.

Course No.: ELE-14210A: **Operating Systems**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: Introduction to Operating System

Operating System, Evolution of Operating System, Operating System Structure, Layered Structure Approach, Virtual Machine, Client-Server Model, Kernel Approach, Classification of Advanced Operating System, Architecture Driven Operating System, Application Driven Operating System, Characteristics of Modern Operating System, Microkernel Architecture, Multithreading and Symmetric Multiprocessing. Concept of Process, System Calls for Process Management, Process Scheduling, Scheduling Algorithms-First Come First serve (FCFS),Shortest Job First (SJF) ,Round Robin (RR), Shortest remaining time next (SRTN) ,Priority Based Scheduling or Event Driven (ED) scheduling, Performance evaluation of the Scheduling Algorithms.

Unit II: Inter-process Communication and Synchronization& Deadlocks

Inter-process Communication and Synchronization , Semaphores ,Classical problems in concurrent programming , Locks, Monitors and Conditional Variables, Deadlocks, Characterization of a Deadlock, A Resource Allocation Graph, Dealing with Deadlock Situations : Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery, Deadlock detection and recovery, Deadlock Prevention: Havender‟s Algorithm Deadlock Avoidance: Banker‟s Algorithm

Unit III: Memory, File Management and Security & Protection

Overlays and Swapping, Logical and Physical Address Space, Single Process Monitor, Contiguous Memory Methods, Paging: Principles of operation, Page allocation, Hardware Support for Paging, Sharing. Segmentation: Principles of operation, Address Translation, Operating systems‟ view of file Management: Directories, Disk Space Management, Disk address translation, and File related system services. Security Threats, Policies and Mechanisms, Authentication: Passwords, Alternative Forms of Authentication, Protection in Computer Systems, Security Models: Access-Control Matrix, Mandatory Access Control, Discretionary Access Control, Rule and Role Based Access Control.

Unit IV: Practicals

History, Features of Unix/Linux, Commands and Processes, Unix/Linux file system, Wild card characters, syntax of Unix/Linux commands, Unix/Linux commands (terminal control characters, login and authentication, information, file management, display content of files, directories, special character handling for C-shell, email and communication, editors and formatting utilities, compiler, interpreter and programming tools), Bourne shell programming.

Recommended Books:

1. Silberschatz Galvin, "Operating System Concepts", 1999, Addison-Wesley Longman.
2. Andrew S.Tanenbaum, Albert S. Woodhull, "Operating Systems: Design & Implementation", 2002, Pearson Education Asia.
3. D. M. Dhamdhere, "Operating Systems: A Concept Based Approach", 002, Tata McGraw Hill Publishing Company.
4. William Stallings Operating Systems internals and design principles 6th Edition, Pearson Education
5. A. S. Godbole, Operating Systems", Tata McGraw Hill, 2002
6. Yashwant Kanitker “Unix Programming” BPB Publication.

Course No.: ELE-14211O **Computing & Informatics - II**
Paper Type: Open Elective **Credits: 1L + 1T + 0P**

Unit-I (Theory):

Introduction to algorithms and flow charts, Introduction to programming, types and categories of programming languages. Introduction to C programming language, declarations, expressions, control statements, arrays, functions, and pointers. Introduction to database management system, basic networking concepts, electronic mail and WWW, introduction to information security.

Unit-II (Tutorial):

Writing C programs using basic programming elements including control statements, arrays, function and pointers. Familiarity with e-mail and information security.

Recommended Books:

1. Yashwant Kanitker "Let Us C" 13th Edition BPB Publication.
2. Michael E. Whitman "Principles of Information Security" 4th Edition, Cengage Learning India.
3. S. K. Srivastava "C in Depth" BPB Publications.
4. Philipa,Wingate "Internet for Beginners" E.D.C Publishing .

Course No.: ELE-14301C **Physics of Semiconductor Devices**
Paper Type: Core **Credits: 3L + 0T + 0P**

Unit I: Crystal Structure and Carrier Transport

Crystal Structure, Space lattices, Primitive and Unit Cell, Index system for crystal planes, Separation between the parallel planes of a cubic crystal, Description of Schrodinger wave equation, Physical interpretation of wave function, Kroning Penney Model, K-space diagram, Effective mass, Concept of Hole, Derivation of Density of state functions, Fermi-Dirac Distribution function, Carrier concentration at thermal equilibrium, Carrier transport Equation ,Decay of photo excited carriers, carrier lifetime, Hall effect.

Unit II: Semi conductor diodes

Abrupt and Graded PN junction, Current- voltage characteristics of PN junction, Depletion capacitance, Diffusion capacitance, Junction breakdown phenomenon, Schottky effect, Bipolar junction transistors, current gain parameters, minority carrier distribution and terminal currents, Eber-Moll model.

Unit III: Field Effect Transistors, Microwave and Opto Electronic Devices

Field effect transistors, JFET and MOSFET- Basic device characteristics with analysis, MOS Capacitors, MOSFET Types- Basic device Characteristics with analysis, Equivalent Circuit.

IMPATT: Static and Dynamic Characteristics, Gun diode and its Modes of operation, P-N Junction Solar Cells, V-I Characteristics, Ideal Conversion efficiency.

Books Recommended

1. *Semiconductor Physics and Devices, Basic Principles by Donald E. Neaman, McGraw-Hill Publishing, 3rd Edition, 2003.*
2. *Solid State Electronic Devices Ben G. Streetman, , Prentice Hall of India Ltd, N. Delhi.*
3. *Physics of Semiconductor Devices S. M. Sze, Wiley eastern Ltd.*
4. *Electronic Processes in Semiconductors, Azeroff and Brophy, McGraw Hill Publishingcompany.*
5. *Physics and Technology of Semiconductor Devices A. S. Grove, , John Wiley and Sons, New York.*

Course No.: ELE-14302C **Control System Engineering**
Paper type: Core **Credits: 3L+0T+0P**

Unit I: Control Systems and System Representation

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods, Control of
Physical Systems: Speed and temperature.

Unit II: Time Domain Analysis of Control Systems

Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit III: Stability and Frequency Analysis

Stability : Conditional an absolute stable systems, location of poles and stability, Routh- Herwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit IV: Introduction to Modern Control Theory

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, state diagrams, Block diagram representation of state equations, state space representation from ordinary differential equations, concepts of controllability and observability.

Recommended Books:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw Hill International
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

Course No.: ELE-14303C **Microprocessors: Architecture, Programming and Interfacing.**

Paper Type: Core **Credits: 3L + 0T + 0P**

Unit I: Architecture, Addressing Modes, Instruction Set and ALP

Introduction to 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU and EU, Working of 8086 Microprocessor, Registers of 8086 Microprocessor and their purpose, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor based system. Introduction to Programming, Various level of Programming, Assembly language programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions. Assembly language Programming for 8086 microprocessor. Use of Macros in ALP.

Unit II: Interrupts, Timing and Processor Modes

Introduction to procedures, interrupts and interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts, Software Interrupts, Hardware Interrupts, Multiple Interrupts, Input /Output structure, ALP using interrupts, Device Access, Operating Systems Calls, BIOS Calls and Direct Device Access, 8259 Programmable Interrupt Controller-Features, Interfacing & Programming, Various Types of 8086 microprocessor, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum Mode 8086 System, 8288 Bus Controller, Maximum Mode 8086 System.

Unit III: Peripheral Devices and Interfacing

Peripheral Devices and Interfacing, Introduction to memory and its types, Memory interfacing, Memory mapped and I/O Mapped Schemes, Even and Odd Addressing. Data Transfer Schemes, I/O Interfacing, Isolated and Memory Mapped I/O instructions, Ports. Study of Peripheral chips: Features, Block Diagram, Control & Status Registers, Operating Modes, Interfacing & Programming of 8255 Programmable Peripheral Interface, 8257 Programmable DMA controller, 8254 Programmable Interval timer, Introduction to DAC0830 Digital to Analog Converters, ADC0804 Analog to Digital Converters, 8279 Keyboard and Display Controller, 8251/16550 (USART), and 8087 Co-processor. Various emerging trends in Microprocessor Design.

Recommended Books:

1. Introduction to 8086, 80186, 80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company.
2. Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company.
3. Microprocessor and x86 Programming, V. R. Vengopal, McGraw Hill Publishing Company.
4. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by W. A. Treibel and Avtar Singh, Prentice Hall.
5. Microprocessors and Interfacing Programming and Hardware, D. Hall, TMG.
6. Microprocessor 8086 Architecture, Programming and interfacing by Sunil Mathur. PHI Learning Pvt. Ltd.

Course No.: ELE-14304LC **Microprocessor and Control Lab**
Paper Type: Core **Credits: 0L + 0T + 6P**

Microprocessors

Addition/Subtraction of 8, 16 and 32 bit numbers. Multi-byte addition and subtraction Multiplication/Division of 8, 16 and 32 bit numbers. Addition of array of 8-bit and 16-bit numbers. Finding Maximum and minimum in an array of 8-bit and 16-bit numbers, to copy a block of data from one portion of memory to another (overlapping and non-overlapping). to find the largest signed number in a given series of data other array operations, multiplication by repetitive addition method, multiplication using MUL instruction, signed multiplication, BCD multiplication 16 bit by 8 bit division, division using DIV instruction, signed division, BCD division, hexadecimal to ASCII conversion and vice versa, ASCII to packed BCD conversion and vice versa, factorial of a given number using iteration and procedures, etc. **Interrupts and Interfacing:** Programming problems using interrupts, subroutines and stack, DOS Interrupts, Stepper motor interfacing with microprocessor, DC motor controller, Elevator simulator, Traffic light controller interfacing with microprocessor, ADC/DAC interfacing with microprocessor.

Control Systems

Design & realize a Op- amp based proportional controller, Integral controller, PD controller. I controller, PlD controller, Lead-lag compensation N/W. Write a Matlab program to find Pole, zero, residue & constant terms of a transfer function, find the transformation of transfer function to state space representation transfer a system representation in state space to transfer function representation, find Step response of a first order system Impulse response of first order system. Write a Matlab program to obtain impulse, step & ramp response of a second order system. Write a Matlab program to find rise time, peak time, maximum overshoot & settling time of second order systems. Write a Matlab program to find unit step response of second &higher order systems. Also express the transfer function in term of partial fractions. Write a Matlab program to plot root locus of second & higher order system & hence comment on stability. Write a Matlab program to plot root locus of a system defined in state space. Write a Matlab program to demonstrate effect of addition of poles & zeros to a transfer function.

Course No.: ELE-14305A **Data Communication and Networking**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit-I: Data Communication

Introduction: Data communication and its components, Data representation and flow. Bit rate, Baud rate, and Bit length. Transmission modes (Serial and parallel) Categories of networks. Line coding and line coding schemes. Digital-to-digital conversion (ASK, FSK, PSK, QPSK), Analog-to-digital conversion (PCM, DM). Multiplexing and multiplexing techniques (FDM, WDM, and TDM). Transmission media Guided and unguided. Transmission impairments.

Unit–II: Networking and Networking Standards

Introduction to Computer Networks, Network Topologies: Bus, Star, Ring, Hybrid, Tree, Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring.

Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer. Introduction to LANs, TCP/IP, Layers of TCP/IP.

Unit-III: Networking Protocols

Internet Protocol, Transmission Control Protocol, User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Congestion and congestion control mechanism.

Internetworking Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: Internet address, sub-netting; Routing techniques, static &. Dynamic routing, Routing table. Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6 Unicast and multicast routing protocols.

Unit-IV: Practicals:

Identification of guided media (UTP, STP, Coaxial) Color coding. Configuration of different types of networks (linear, star and ring). IP addressing (static and dynamic). Sharing the resources in wired network (software and hardware). Configuring the Windows server (Active directory) and DHCP server. Configuring the Linux server. Configuring the wireless networks (Adhoc and infrastructure).Sharing of resources in wireless network.

Recommended Books:

1. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred,
2. 2000, Addison Wesley, Low Price Edition.
3. Data Communications and Computer Networks 5E, Forozaun, McGraw Hill
4. Business Data Communications, Fitzgerald Jerry,
5. Computer Networks–A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition.
6. Computer Networks by Andew S. Tanenbaum 3rd Edition. Prentice Hall.
7. Computer Networking – ED Tittel, 2002, T.M.H.

Course No.: ELE-14306A: **Digital Signal Processing**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit-I: Discrete Time Signals and Systems
Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIR systems, IIR systems, Recursive Systems, Non- recursive Systems, Representation of LSI systems by Constant Coefficient Equations, Correlation: Cross- Correlation and Auto-Correlation, Properties, A/D Conversion Process: Sampling, Frequency Relationships, Aliasing, Quantization, Encoding, Anti Aliasing Filter. Fourier Series and Fourier Transform, Sampled data and discrete time convolution, Z transform and its Properties.

Unit –II: Discrete Fourier Transform (DFT)

Introduction, Frequency Domain Sampling, Properties of DFT, Linear Filtering Techniques based on DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT algorithms, Properties of *WN*, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

Unit -III: Theory and Design of Digital Filters

Types of Digital Filters: Structure of FIR Systems, FIR Filter Design using Windows: Rectangular Windows for FIR Filter Design, Gibbs Phenomenon, Commonly used Windows functions (Examples), Design of Hilbert Transformers, FIR differentiators and Integrators, Brief introduction to IIR filter design

Unit- IV: Practicals using MATLAB

Introduction to digital signal processing toolbox (MATLAB). Commonly used DSP based commands in MATLAB, Computation of Correlation and convolution of various sequences using MATLAB. Optimal order FIR filter design in MATLAB. Performance analysis of various windowing techniques for a given set of specifications using MATLAB

Recommended Books:

1. Theory and Applications of Signal Processing, L. R. Rabiner and B. Gold, Prentice Hall 1985
2. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
3. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
4. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

Course No.: ELE-14307A **HDL and Digital System Design**
Paper type: Allied Elective **Credits: 3L+0T+2P**

UNIT I: Hardware Description Languages and VHDL
Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioural, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes: Assignment, Logical, Arithmetic, Relational and concatenation operators

UNIT II: Concurrent, Sequential Codes and State Machines
Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, PROCESS, IF, ELSIF, WAIT, CASE, LOOP, Signal versus Variable, Bad Clocking, Brief concepts of Finite State Machines,(Melay and Moore Machines), state diagrams and state tables.

UNIT III: Combinational and Sequential Circuit Design(Theory+Practical)
Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, Demultiplexers, encoders, decoders,code converters, comparators, Boolean functions using Multiplexer. Shanons expansion theorm, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UPDOWN, Johnson and Ring Counters.

UNIT IV: Practicals
Introduction to COMPONENTS and FUNCTIONS, Port Mapping, Digital system design: VHDL modeling of ALU, Pseudo random Number Generator, Sequence detector, Barrel shifter, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices (CPLD) and Field Programmable Logic Arrays(FPGA), Advantages of FPGAs, Application Specific integrated Circuits (ASIC), FPGA design flow.

Recommended Books:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Perry D. L., VHDL Programming by Example, TMH,2000.
4. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
5. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design, TMH.2008.

Course No.: ELE 14308A: **Microcontrollers and Embedded Systems**
Paper Type: Allied Elective **Credits: 3L+0T+2P**

UNIT-I: Embedded systems and processors
Introduction to embedded systems, Components of an embedded system, Types of embedded system, Levels of embedded system, Embedded System applications, embedded system design considerations, Embedded Processors: Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessment of Embedded Processors. Embedded memory devices and Embedded I/O. Embedded programming.
Microcontrollers: Microcontrollers for embedded systems, classes of microcontrollers, types of microcontrollers. Choosing a Microcontroller for an embedded application.

UNIT-II: 8051 Architecture
8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture, bare minimum system with external circuits, other members of 8051.Addressing modes :accessing memory using various addressing mode, Jump, Loop and call instructions ,time delay generation and calculation, Single bit instructions and programming, I/O port programming.

UNIT-III: 8051 Timers, Counters, Serial Communication, Interrupts and Programming
Timer and counter architecture in 8051, programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication in 8051: Basics of Serial communication, 8051 connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051, programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.
Interfacing memory with 8051, Programmable peripheral interface (PPI)-8255, 8255 interfacing with 8051. Interfacing Key board, LCD, A/D & D/A converters, DC motor, Relay, solenoid, stepper motor ,servomotor with 8051.

UNIT-IV:Practicals
Programming using 8051 microcontroller kit, Interfacing of A/D converter and D/A converter modules with Microcontroller 8051,Interfacing of Alphanumeric LCD display and Matrix keyboard interface modules with Microcontroller 8051,Interfacing of Seven segment display and Stepper motor modules with Microcontroller 8051. Design and construction of a simple flash programmer for 89C51/89C2051 μC, Computer aided assembly language program development for 89C51/89C2051 using Keil micro vision environment, Use of assembler, linker and simulator for 89C51/89C2051. Microcontroller Interfacing and construction of the following modules, Alphanumeric LCD display- Matrix keyboard interface- Seven segment display- dc geared motor- Stepper motor- Infra red transmission and reception.

Recommended Books

1. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw Hill, Third Reprint, (2003).
2. John Catsoulis, O‟Reilly, "Designing Embedded Hardware". Indian Reprint (2003).
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
4. Kenneth J.Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.

Course No.: ELE-14309A: **Bio-Medical Instrumentation**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

UNIT I: Electro-Physiology and Bio-Potential Recording
The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II : Bio-Chemical And Non Electrical Parameter Measurement
PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, hearing aids, respiratory measurement, oximeter, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III: Assist Devices, Bio-Telemetry and Recent Trends
Cardiac pacemakers, DC Defibrillator, physiotherapy, diathermy, nerve stimulator, artificial kidney machine. Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation. Medical imaging, X-rays, laser applications, ultrasound scanner, echo-cardiography, CT Scan MRI/NMR, cine angiogram, colour doppler systems, Holter monitoring, endoscopy.

UNIT IV: Practicals
Study of Electrocardiogram, Electroencephalogram, Electromyogram, Bio-chemical parameters, Oximeter, Blood pressure measurement machine, Hearing Aid, Assist devices, telemetry system. Study of Bio-medical Instruments.

Books Recommended

1. Leislie Cromwell, “Biomedical instrumentation and measurement”, Prentice Hall of India, New Delhi, 2002.
2. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 1997.
3. Joseph J.Carr and John M.Brown, “Introduction to Biomedical equipment Technology”, John Wiley and Sons, New York, 1997.

Course No.: ELE-14310A **Soft Computing and Neural Networks**
Paper Type: Allied Elective **Credits: 3L+0T+2P**

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle for Fuzzy Sets, Concept and models of Fuzzy logic Circuits-viz. AND, OR and NOT.

Unit II: Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, Probability vs. possibilities, Approximate reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition of compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rule based models.

Unit III:

Introduction to Neural Networks

Biological and Artificial Neurones, Neuron Models: Classification and Linear Separability, X-OR Problem, Hopfield Networks, Overview of Neural Networks Architectures: Mulyilayered Feed forward and Recurrent Networks, Learning: Supervised, Unsupervised and Reinforcement, Learning Laws. Back-propagation (BP) Networks, Generalized delta rule, BP Training Algorithm and Derivation for Adaptation of Weights, Applications of BP Networks.

Unit IV: Practicals

Write a program to:

Implement and function using Adaline with bipolar inputs andoutputs; to implement and function using Madaline with bipolar inputs andoutputs; implement art 1 network for clustering input vectors with vigilance parameter; implement composition of fuzzy and crisp relations; perform max-min composition of two matrices obtained fromCartesian product; verify the various laws associated with fuzzy set.

Write a Matlab program to:

Implement discrete Hopfield network and test for input pattern; implement back propagation network for agiven input pattern; implement full counter propagation network for agiven input pattern; implement fuzzy set operation and properties.

Text Books:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klir abd B. Yuan, Printice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, Printice Hall of India
3. Neura;l Networks in Computer Intellligence, Limin Fu, Mcgraw Hill International
4. Adaptive Recognition and Neural Networks, Yoh-Han Pao, Addison Weseley
5. Introduction to the Theory of Neural Computations, John Hertz, Anders Krogh and Richard G. Palmer, Addison Wesley.

Course No.: ELE-14311A **Advanced Communication Systems**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit-I Modern Radar System

Fundamentals of Surveillance Radar and Design : Bandwidth considerations, prf, Un-ambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter. Tracking Radar Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Mono pulse Radar.

Unit-II Telecommunication Switching Techniques

Time division switching: Time switching, space switching, Three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling

Unit-III Satellite Communication

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N). Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT.

Unit- IV Practicals

To develop a simple switching model using Matlab, to study various multiplexing techniques used telecommunication networking, to study stored program based space division switch, to under fading in satellite communication using wireless communication link, to verify radar equation in Matlab

References:

1. J.G. Proakis, “Digital Communication”, MGH 4TH edition.
2. Edward. A. Lee and David. G. Messerschmitt, “Digital Communication”, Allied Publishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, “Digital Communication Techniques”, PHI.
4. William Feller, “An introduction to Probability Theory and its applications”,Wiley.
5. Sheldon.M.Ross, “Introduction to Probability Models”, Academic Press, 7th edition.

Course No.: ELE-14312A **Fundamentals of RF Design**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

UNIT I: Introduction, Active RF Component and Modelling
Importance of RF Design, RF Behaviour of Passive Components, Chip Components and Circuit Board Considerations, General Transmission Line Equation, Micro Strip Transmission Lines, **Single and Multi Port Networks:** Interconnecting Networks, Network Property and Application, Scattering Parameters.

Semiconductor Basics, RF Diode, Bipolar Junction Transistor, RF Field Effect Transistors, High Electron Mobility Transistor, Diode Models, Transistor Models

UNIT II: RF Transistor Amplifier & RF Filter
Characteristics of Amplifiers, Amplifiers Power Relation, Stability Considerations, Constant Gain, Noise Figure Circles, Constant VSWR Circles, Broad Band, High Power and Multistage Amplifiers

Overview of RF Filter design, Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise, Amplifier design in various technologies,

Power Amplifier design, Design issues in integrated RF filters.

UNIT III: RF Oscillators and Mixers
Basic Oscillator Model, High Frequency Oscillator Configuration, Basic Characteristics of Mixers. Design of Mixers at GHz frequency range, various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Resonator VCO. designs, Radio frequency Synthesizers- PLL, Various RF Synthesizer architectures and frequency dividers

UNIT IV: Practicals:
Simulated Design of RF: Low Noise Amplifier (LNA), Filter, Oscillator, Frequency Synthesizer, Power Amplifier, Mixer, PLL, Frequency Divider, VCO

Books Recommended

1. *Reinhold Ludwig, Pavel Bretchko,"RF Circuit Design",1st Indian Reprint,2001,Pearson Education Asia*
2. *B Razavi,"Design Of Analog CMOS Integrated Circuit",Mc Graw Hill,2000.*
3. *R. Jacob Baker, H.W. Li, D.E. Boyce " CMOS Circiut Design, layout and Simulation" PHI 1998*
4. *Y.P. Tsividis "Mixed Analog and Digital Devices and Technology" TMH 1996*
5. *Thomas H. Lee "Design of CMOS RF Integrated Circuits" Cambridge University Press 1998.*

Course No.: ELE- 14313A **Speech and Audio Processing**
Paper Type: Allied Elective **Credits: 3L+0T+2P**

UNIT-I: Fundamentals of Speech

The human speech production mechanism, LTI model for speech production, nature of the speech signal, linear time varying model, types of speech, voiced and unvoiced decision making, audio file formats: nature of WAV file, parameters of speech, spectral parameters of speech

UNIT-II: Linear prediction of speech and Quantization

Lattice structure realization, forward linear prediction, auto correlation covariance method, uniform and non-uniform quantization of speech, waveform coding of speech,the .726 standarad for ADPCM, parametric speech coding technique, RELP based vocoder, Transform domain coding of speech, sub-band coding of speech

UNIT-III: Speech Synthesis

History of text- to- speech system, synthesizer technologies, HMM based speech synthesis, sine wave synthesis, speech transformation, emotion recognition from speech, watermarking for authentication of a speech/ Music signal, digital watermarking, watermarking in capestral domain

UNIT-IV: Practicals using Matlab

To simulate speech processing model using Matlab, Speech recognition systems implementation Acoustic analysis, linear time warping, dynamic time warping (DTW), Statistical Sequence Recognition for ASR: Bayes rule, Hidden Morkov Model (HMM), VQ- HMM based speech recognition. Speech watermarking using Discrete cosine Transform (DCT), Discrete Wavelet Transform

References:

1: Speech and Audio Processing, Dr. Shaila D. Apte, Wiley Publications

2: Digital Signal Processing, Dr. Shaila D. Apte, Wiley Publications

3: Theory and Applications of Signal Processing, L. R. Rabiner and B. Gold, Prentice Hall 1985

4: Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985

5: Introduction to Digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall

Course No.: ELE-14314A **Digital CMOS IC Design**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

UNIT-I: Digital ICs and their Implementation Strategies
Digital IC, issue in digital IC design, Quality, metrics of Digital Design. Review of CMOS. Custom, Semi custom Circuit Design, Cell–Based Design Methodology, Array Based implementation Approach. Introduction to Digital Circuit Layout

UNIT-II: Digital Combinational and Sequential Circuit Design
Static CMOS Inverter and its characteristics, CMOS Design consideration Transistor Sizing, Power Dissipation, Design Margining, Ratioed Logic, Pass Transistor Logic, Dynamic CMOS design, basic principle, speed and power Dissipation of Dynamic Logic, Signal Integrity in Dynamic Design, Cascaded Dynamic. Introduction, Static Latches and registrars, Dynamic Latches and Registers, Alternative Register Styles, Pipelining.

UNIT-III: Memory Design and Programmable logic devices
Memory Classification, Memory Architecture and Building Block, Read only Memories, Nonvolatile Read Write Memories, Read-Write Memories, Memory Peripheral Circuits. Introduction to Programmable logic devices: PLA, PAL, PLD/CPLD, FPGA, ASIC, their applications and Architecture

UNIT-IV: Practicals:
Designing Static and Dynamic Combinational/Sequential Logic Circuits in CMOS; Designing Static and Dynamic Memory in CMOS; Designing Programmable logic devices in CMOS.

Books Recommended

1. J.M. Rabaey, A. Chandrakasan and B. Nikolic: Digital Integrated Circuits- A Design Perspective, 2nd ed., PHI, 2003.
2. D.A. Pucknell and K. Eshraghian, Basic VLSI Design, PHI, 1995.
3. E.D. Fabricius, Introduction to VLSI Design, McGraw Hill, 1991.
4. N.H.E. Weste and K. Eshraghian, Principles of CMOS VLSI Design - a System Perspective, 2nd ed., Pearson Education Asia, 2002.
5. S.M. Kang and Y. Leblevici, CMOS Digital Integrated Circuits Analysis and Design, 3rd ed., McGraw Hill, 2003.
6. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia) Pte Ltd, 2002.
7. W. Wolf, Modern VLSI Design - System on Chip design, 3rd ed., Pearson Education, 2004.
8. R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 1997.

Course No.: ELE-14315O **Basic Electronic Science and Applications**
Paper Type: Allied Elective **Credits: 1L + 0T + 2P**

UNIT-I Theatrical Foundation
The fundamental concepts of electricity and electronics that involve Direct Current (DC), Alternating Current (AC); Series and parallel resistive and capacitive circuits; magnetism; inductance; capacitance; transformers and motors; Transformer winding.

Electronic components (Resistor, Capacitor and Inductors), and various types of test equipment found in industry;

Semiconductor devices like Diodes and Binary Junction Transistors (BJT); Rectifiers and Filters, identification of Regulator ICs, 5 to 15 V regulated DC Power supplies, Transistor biasing and amplifier circuits.

Basic Logic Gates and Boolean Algebra. Binary numbers. Introduction to ICs (linear and digital). Identification of parts of a digital computer.

UNIT-II Practicals
Experimental work on the basic electronic circuits and systems as listed in Unit-I
Implementation of few Electronic Hobby circuits.

Books Recommended:

1. Electronic Devices and Circuit Theory. By: Robert Boylestad & Louis Nashelsky. Prentice Hall.

2. Microelectronics. By: Milliman and Grabel, McGraw Hill Company

3. Electricity Principles and Applications by Richard Fowler

4. Modern Digital Electronics. By: R P Jain. Tata McGraw-Hill Education

Course No.: ELE-14401C **Digital Communication and Information Theory**
Paper Type: Core **Credit: 4L+0T+0P**

UNIT I: Information Theory
Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a Discreate Memoryless Channel ,Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy,Mutual Information, Discrete Communication Channels, Channel representation and Channel Matrix, Mutual information for each channel, Channel Capacity, Shannon"s Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon- Fano Coding, Huffman Coding,.

UNIT II: Pulse Code Modulation
Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM,

UNIT III: Band Pass Digital Carrier Modulation and Channel Coding
Digital modulation techniques: Generation and Detection of Amplitude Shift Keying (ASK), frequency Shift keying (FSK), Phase Shift Keying, and Differential Phase Shift Keying (PSK and DPSK), base band receiver Optimum Filter, Correlator, Probability of Error in each Scheme,. Error Control Coding: Linear Block codes, (7, 4) Linear Block Coding, matrix representation of linear block codes, Cyclic Codes, polynomial representation (examples)

UNIT IV: Wide Band Digital Communications
Basics of Wide band Systems, Generation of Spreading Codes (PN Codes, Gold Codes), Properties of PN codes, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation and Detection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Introduction to Digital Cellular Communication Systems: Architecture of GSM

Text Books and References:

1. Digital Communication By Simon Hykin.
2. Digital and Analog Communication by K. Shan Mugam.
3. Digital and Analog Communication by Tomasi.
4. Digital and Analog Communication Systems by Leon W. Couch, II.Pearsons Education
5. Digital Communications By Bernard Sklar, Pearsons Education.
6. Digital Communications By John G. Proakis McGraw- Hill International Editions.
7. Wideband Wireless Digital Communications by Andreas F. Molisch, Pearsons Education.
8. Information Theory Coding and Cryptography by Ranjan Bose, TMH.

Course No. ELE-14402C **VLSI Technology**
Paper Type: Core **Credits: 3L+0T+0P**

Unit I: Crystal Growth, Epitaxy and Diffusion:

Crystal Growth and Wafer Preparation, Electronic grade Germanium and Silicon, Zone melting process of purification, Simple purification process, Czhrolaski method. Epitaxy, Vapor phase epitaxy, Transport process and Reaction kinetics, Molecular beam Epitaxy process *(introduction).*
Fick‟s one dimensional diffusion equation, Diffused layers, Pre deposition step, Drive-in diffusion with expression, Field aided diffusion, Diffusion system, C-V technique for profile measurement, Junction depth and sheet resistance measurement.

Unit II: Oxidation and Lithography:
Oxidation Techniques, Growth mechanism and Kinetics of Oxidation layers, Oxidation techniques and Systems. Lithography, Lithography process and Types of Lithography, Optical Lithography, Contact proximity and projection Lithography techniques, Resists, Electron beam Lithography, Electron Resists.

Unit III: Etching, Metallization and IC Fabrication
Etching, Subtractive and Additive method of pattern transfer, Resolution and edge profiles in Subtractive pattern transfer, Selectivity and feature size control of an etching process. Contacts *(Ohmic and rectifying)*, Physical vapor deposition, Methods of physical vapor deposition, Resistance heated evaporation, Electron beam evaporation, Thickness measurement and monitoring. Basic consideration for IC processing and Packaging, Modern IC fabrication.

Text Books and References:

1. Physics of Semiconductor Devices, S. M. Sze, , Wiley eastern Ltd.
2. Electronic Processes in Semiconductors, Azeroff and Brophy, , McGraw Hill Publishing company.
3. Physics and Technology of Semiconductor Devices A. S. Grove, , John Wiley and Sons, New York.
4. Solid State Electronic Devices Ben G. Streetman, , Prentice Hall of India Ltd, N. Delhi.
5. S. M. Sze, VLSI Technology, Mcgraw Hill Publishing Company.

Course No.: ELE-14403C **Industrial Organization and Technopreneurship Development**

Paper Type: Core **Credits: 2L+0T+0P**

Unit-I Technology Innovation and Technopreneurship Development

Technology innovation and invention, Intellectual Property Rights (IPR), Patents & Designs, Drafting of a Patent application, Concept and role of Technology based entrepreneurship (Technopreneurship).

Unit-II Principles of management and Human & Industrial relations:

Management, different functions of management, planning, organization, co-ordination and control. Structure of an industrial organization, Functions of Different Departments.

Human relations and performance in organization, Understanding self and others for effective behavior, Behavior modification techniques, Relations with subordinates, peers and superiors.

Unit-III Professional ethics and Entrepreneurship Development:

Concept of Ethics, need for professional ethics, code of professional ethics, Typical Problems of Professional Engineers.

Concept of Entrepreneurship, Need of Entrepreneurship, Characteristics of an Entrepreneur, Meaning and importance of small scale industry, steps for planning a small scale industry. Consideration for product identification and selection, project report preparation, management of small scale industry.

Course No.: ELE-14406A **CMOS Circuit Design: Analog and Mixed**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit I: MOSFET Operation and analog CMOS Sub-circuits
Overview of MOSFET: Regions of operation, Threshold Voltage and Body Effect, Floating Gate and Bulk MOSFETs, I-V Characteristics of MOSFETs, Long-Channel and Short Channel Modeling of MOSFETs, A brief introduction to Design layout. MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources; Current Mirrors; Current and Voltage References; Amplifier, Differential Amplifier; Comparator;

Unit II: Translinear Circuits, Analog Multipliers and Mixers
Translinear Circuits: Ideal Translinear Element, Translinear Signal representations, Translinear Principle, Translinear-loop-circuit synthesis, Various Translinear circuits, Squarer/divider, Squarer rooting. The Gilbert Cell; Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, MOSFET Mixers, Fully Balanced (Quad) Mixer; Modulators; AM Demodulation using Analog Multipliers; FM Demodulators using Multipliers.

Unit III: Data Converters
Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators;

Unit IV: Practicals
Introduction to PSPICE Orcad, Generating a Netlist File, PSPICE Schematics, Circuit description, DC circuit analysis, Transient analysis, AC circuit analysis, PSPICE Simulation Examples on: MOSFET effects and Characteristics, MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources; Current Mirrors; Current and Voltage References; Amplifier, Differential Amplifier; Comparator, Translinear Circuits, Gilbert Cell; Analog Multipliers, ADC, DAC and Oversampled converters

Books Recommended

1. *Analysis and Design of analog integrated circuits, P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, John Wiley and Sons, 2001.*
2. *CMOS, Circuit Design, Layout, and Simulation, R. Jacob Baker, JOHN WILEY & SONS, 2010.*
3. *CMOS analog circuit design, P. E. Allen and D. R. Holberg, Oxford University Press, 2002.*
4. *Analog VLSI: Circuits and Principles, Shih-Chii Liu et al, The MIT Press, 2002.*

Course No.: ELE-14407A **Information Security**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit 1: Information security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers, Cryptanalysis. Cryptanalysis of classical ciphers. Introduction to modular arithmetic.

Unit II: Cryptographic Algorithms

Data scrambling and descrambling, Introduction to Data encryption standard, Security of DES, Differential and linear cryptanalysis, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Geffe generator, Stop and Go generator

Unit III: Information Hiding for covert communications

Need of information hiding, Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains. Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Unit IV: Practicals using MATLAB

Introduction to image processing toolbox. Frequently used commands for image manipulation (IMSHOW, IMREAD, IMWRITE, RAND, RANDN, RANDPERM etc.), Image encryption using MATLAB. Implementation of LSB and ISB algorithms, Frequency domain data hiding in MATLAB.

Recommended books:

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", Prentice-Hall, New Jersey, 1999.
2. B. Schneier, “Applied Cryptography", John Willey & Sons, Inc., 2nd edition, 1996.
3. Lu, S.: Multimedia security: Stegnography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Course No.: ELE-14408A: **Nanotechnology**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit–I: Nanotechnology and Nano-electronics

Introduction to Nanotechnology: size–dependant physical properties, Melting point, solid state phase transformations, excitons, band-gap variations-quantum confinement, effect of strain on band-gap in epitaxial quantum dots. The p-n junction and the bipolar transistor; metal semiconductor and metal-insulator, Semiconductor junctions; field-effect transistors, MOSFETs,

Unit-II: CMOS Heterostructures and SET

CMOS: heterostructures, high-electron-mobility devices, HEMTs, Quantum Hall effect, Resonant Tunnel Diodes. Introduction to single electron transistors (SETs): quantum dots, single electron effects, Coulomb blockade.

Unit-III: Semiconductor Nanoparticles and Nanowires

Semiconductor nanoparticles – applications, Optical luminescence and fluorescence from direct band gap semiconductor nanoparticles, surface-trap passivation in core-shell nanoparticles, carrier injection, polymer-nanoparticle, LED and solar cells, electroluminescence, barriers to nanoparticle lasers, doping nanoparticles, Mn-Zn-Se phosphors, light emission from indirect semiconductors, light emission form Si nanodots.

Semiconductor nanowires, Fabrication strategies, quantum conductance effects in semiconductor nanowires.

Unit-IV: Practicals

Study of Methods to create and Nanofeatures; designing Nano-Devices in Simulation; study of performance change with material change; Process and Device Simulation of Single-Electron Transistor (SET); SOI based nanowire single-electron transistor - Design, simulation and process development; Simulation study of nanowire TFET device; Process design and development of 30 nm CMOS inverter; Characterization and analysis Double gate SOI MOSFET for nano electronic circuits; Process and device simulation of Silicon Nanowire FinFET device.

Books Recommended:

1. Encyclopedia of Nanotechnology- Hari Singh Nalwa
2. Springer Handbook of Nanotechnology - Bharat Bhusan
3. Handbook of Semiconductor Nanostructures and Nanodevices Vol 1-5- A. A. Balandin, K. L. Wang.
4. Nanostructures and Nanomaterials - Synthesis, Properties and Applications - Cao, Guozhong.

Course No.: ELE- 14409A **Mobile Communication**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit-I Introduction to Cellular Mobile Systems:

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems. Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems. Interference: Introduction to co-channel interference, real time co-channel interference co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

Unit-II Cell Coverage for Signal & Traffic:

General introduction, obtaining the mobile point to point mode, Radio propagation characteristics: models for path loss, shadowing and multipath fading, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Unit-III Cell Site Antennas and Mobile Antennas:

Characteristics of antennas, antenna at cell site, mobile antennas Frequency Management, Channel Assignment and hand off: Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, handoff analysis, dropped call rates & their evaluation.

Unit-IV Practicals

To study Multiple access techniques used in mobile wireless communications: FDMA/TDMA, CDMA. FDM/TDM Cellular systems, to study architecture of Global System for Mobile Communication (GSM) system overview: Mobility management, Network signaling , Hands on practice on GSM and CDMA using training systems

Books Recommended:

1. Wireless Communication; Principles and Practice; T.S.Rappaport
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996.
3. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
4. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
5. Mobile Communication Engineering – Theory & Applications; TMH

Course No.: ELE-14410A **Advanced Microprocessors**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit 1: Intel 8086, 80186 and 80286 Processors

Architecture and working of 8086 and 80186 Microprocessor, Register set of 8086 and 80186 Microprocessor, Addressing Modes and memory segmentation in 8086 and 80186 microprocessor, Differences between 8086 and 80186 microprocessors. Intel 80286 Microprocessor, 80286 Architecture, system connection – Real and Protected mode operations.

Unit 1I: Intel 80386 and 80486 Processors

Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection – call gates – I/O privilege levels – Interrupts and exception handling – task switching – paging mode – 80386 virtual 86 mode operation.80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode.

Unit 1II: Advanced and Special Purpose Processors

Pentium – super scalar architecture – u-v pipe line – branch prediction logic – cache structure – BIST (built in self-test) – Introduction to MMX technology. Difference between CISC and RISC processors, various emerging trends in Microprocessor Design. Architecture, addressing and programming of Digital Signal processors.

Unit IV: Practicals

Instruction sets of Intel Processors, Programming exercises for 16, 32 and 64 bit data processing, Use of Macros and Procedures, IVT and ISR, DSP programming for Image Processing such as Image Compression, Image restoration, image Enhancement.

Recommended Books:

1. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company
2. Advanced Microprocessors by Daniel Tabak McGraw-Hill.
3. Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.
4. Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education
5. Advanced Microprocessors by Y. Rajasree, New Age International.

Course No.: ELE-14411A **Analytical Instrumentation**
Paper Type: Allied Elective **Credits: 3L + 0T + 2P**

Unit-I: Instrumental Methods

Introduction: Introduction to chemical analysis, Classical and Instrumental methods, Classification of Instrumental techniques, important considerations in evaluating an instrumental method; Absorption methods: Spectrometric UV and VIS methods: Laws of photometry, Instrumentation. IR spectrometry: correlation of IR spectra with molecular structure, Instrumentation. Atomic absorption spectrometry: Principle, Instrumentation

Emission methods: Flame, AC/DC arc, spark, plasma excitation sources, instrumentation

Unit-II: Spectrometry and Chromatography

Spectrofluroscence and phosphorescence spectrometer: Instrumentation, Raman spectrometer.

Mass spectrometer: Ionisation methods, mass analysers, mass detectors, FTMS.

Chromatography: Classification, Gas chromatography, Liquid chromatography, Instrumentation

Unit-III: Diffractometry, Electron microscopy, spectroscopy and Electroanalytical methods

X-ray and Nuclear methods: x-ray absorption, fluorescence and diffractometric techniques, and microprobe, ESCA and Auger techniques, nuclear radiation detectors.

NMR spectroscopy: Principle, chemical shift, spin-spin coupling, instrumentation, types of NMR. Electroanalytical methods: potentiometry, voltammetry, coulometry techniques.

Unit-IV: Practicals

Study of: Recorders, Flame Photometer, Spectro-Photometer, Liquid Analyser, Gas Analyser, Dissolved Oxygen Analyser, Gas chromatograph, Scanning Electron Microscope (SEM), X-ray Diffractometer.

Books Recommended

1. Willard, Merritt, Dean and Settle, *Instrumental Methods of Analysis*, 7th edition, (CBS publishers, New Delhi).
2. Galen W. Ewing, *Instrumental Methods of Chemical Analysis*, 5th edition, (McGraw-Hill Book Company)

Course No.: ELE-14412A **Digital Image Processing**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Various Pixel manipulation operations using MATLAB. Review of Image transforms: 2D-DFT, FFT

Unit II: Image Enhancement and Restoration

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations..

Unit III: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG and MPEG. Image Compression using MATLAB

Unit IV: Practicals

Introduction to Image processing Toolbox. Frequently used commands in image processing. Image filtering and restoration using MATLAB. Image compression using MATLAB.

Books Recommended

1. Gonzalez and Woods, "Digital Image Processing", 2 Ed, Pearson Education, 2002.
2. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly "The Data compression Book" 2 Ed, bpb Publications.
4. Pratt William K.,"Digital Image Processing", John Wiley & sons
5. Chanda & Majumdar, "Digital Image Processing and Analysis" , PHI.
6. M.Sonka,V. Hlavac, R. Boyle, "Image Processing, Analysis and Machine Vision", Vikas Publishing House

Course No.: ELE-14413A **Parallel Computation and Architecture**
Paper Type: Allied Elective **Credits: 4L + 0T + 0P**

Unit I:
Introduction: scope and issues of parallel computing, taxonomy of Parallel Architectures, Control Mechanism, Address-space Organization, Interconnection Networks, Processors Granularity, SIMD Architecture: Overview of SIMD Architecture. Design and Performance Issues, MIMD Architecture: Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, Parallel Vector Processors (PVP), Symmetric Multiple Processors (SMP), CC-NUMA, NUMA and COMA Architectures, Distributed Memory Architecture: Cluster Architecture -Design and other Issues MPP Architecture

Unit II:
Basics of Interconnection Networks: Interconnection Environments, Network Components, Network Characteristics, Network Performance Metrics, Network Topologies and Properties: Topologies and Functional Properties, Routing Schemes and Functions, Networking Topologies, Buses, Crossbar and Multistage Switches: Multiprocessor Buses, Crossbar Switches, Multistage Interconnection Networks, Comparison of Switched Networks, Gigabit Network Technologies: Fiber Channel and FDDI Rings, Fast Ethernet and Gigabit Ethernet, Myrinet for SAN/LAN Construction

Unit III:
Paradigms and Programmability: Algorithmic Paradigms, Programmability issues Parallel Programming Examples, Parallel Programming Models: Implicit Parallelism, Explicit Parallel Models, Other Parallel, Programming Models, Shared Memory Programming: The POSIX Threads (Pthreads) Model, The Open MP Standard, Message-Passing Programming: The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM), Data Parallel Programming: The Data Parallel Model, The Fortran 90 Approach, Ottler Data Parallel Approaches

Unit IV:
Performance Metrics for Parallel Systems: Run Time, Speedup, Efficiency Cost, Scalability and Speedup Analysis: Amdahl's Law: Fixed Problem Size, Gustafson‟s Law: Fixed Time, Sun and Ni's Law: Memory Bounding, ISO performance Models, Sources of Parallel Overheads: Inter-processor Communication, Load Imbalance Extra Computation, System and Application Benchmarks: Micro Benchmarks, Parallel Computing Benchmarks. Business and TPC Benchmarks, SPEC Benchmark Family.

Recommended Books:

1. Kai Hwang and Zhiwei Xu, "Scalable Parallel Computing", 1997, McGraw Hill New York.
2. Vipin Kumar, Ananth Grama, Anshul Gupta, George Karypis, "Introduction to Parallel Computing, Design and Analysis of Algorithms", 1994, Redwood City, CA, Benjmann/ Cummings.
3. Barry Wilkinson and Michael Allen, "Parallel Programming", 1999, Pearson Education Asia.
4. AI Geist, Adam Beguelin, Jack Dongarra, Weicheng Jiang, Robert Manchek and Vaidy Sunderam,
5. "PVM: Parallel Virtual Machine -A Users' Guide and Tutorial for Networked Parallel Computing", 1994, MIT Press.
6. Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, Dror Maydan, and Jeff McDonald, "Parallel Programming in OpenMP", 2000, Morgan Kaufmann.

Course No.: ELE-14414A **Multimedia Systems**
Paper type: Allied Elective **Credits: 3L+0T+2P**

Unit I: Introduction to Multimedia Systems and Processing

Introduction to multimedia systems, Multimedia signals, various sources of multimedia signals, Motivation for growth of multimedia theory, different elements of multimedia communication system, Challenges involved with multimedia signal processing and communication

Unit II: Lossless Image Compression

Redundant information in images. Lossless and lossy image compression. Elements of an image compression system, Huffman coding. Limitations of Huffman coding. Arithmetic coding(Basic principal). Encoding and Decoding procedure of a n arithmetic coded bitstream. Coding limitations of arithmetic coding. Introduction to Lempel-Ziv and Run length coding

Unit III: Lossy Image Compression

Theory of Quantization, uniform and non-uniform quantization, scalar and vector quantization. Lloyd-Max quantizer. Rate-distortion function,Lossy predictive coding. Pixel encoding using Delta modulation, source coding theorem.

Unit IV: Multi-resolution Analysis: Theory of Sub band Coding

Subband coding and decoding of one-dimensional signals. Analysis and synthesis filters. Down-sampling and upsampling. Subband coding for a two-dimensional four-band filter bank. Introduction to Discrete Wavelet Transforms (DWT) and its inverse. Calculation of DWT and inverse DWT through subband coding and decoding. DWT-based still image compression and coding system. Introduction to embedded wavelet coding.

Recommended Books:

1. Shuman and Thomson, Introduction to Multimedia, Tata Mcgrah Hill 2007.
2. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
3. N. J. Fliege, Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets, Wiely publishers ,1999

DETAILED SYLLABUS

Under

Choice Based Credit System (CBCS) Scheme

For

M. Sc Programme in Electronics

(Academic Session 2015 and onwards)

APPROVED BY BOS, HELD ON 23-05-2015

P. G. Department of Electronics &
Instrumentation Technology
University of Kashmir, Hazratbal, Srinagar-6, J&K

Course: M. Sc. (Electronics)						SEMESTER-I
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-15101C	Circuit Analysis and Synthesis	Core	2	0	2	2+1
ELE-15102C	Antennas and Wave Propagation	Core	2	0	2	2+1
ELE-15103C	Linear Integrated Circuits and Applications (LICA)	Core	2	0	2	2+1
ELE-15104C	Digital Electronics and C-Programming Lab	Core	0	1	4	1+2
ELE-15105DCE	Engineering Mathematics	DCE	2	1	0	2+1
ELE-15106DCE	Signals and Systems	DCE	2	0	2	2+1
ELE-15107DCE	CMOS VLSI and Nano-Electronics –I (MOSFET Theory)	DCE	2	0	2	2+1
ELE-15108DCE	Electronics Engineering Materials and Components	DCE	2	0	2	2+1
ELE-15109DCE	Statistical Communication Theory	DCE	2	0	2	2+1
ELE-15110DCE	Instrument Fabrication and Maintenance	DCE	2	0	2	2+1
ELE-15111DCE	Opto-Electronic Devices	DCE	2	0	2	2+1
ELE-15112DCE	Data and Computer Communication	DCE	2	0	2	2+1
ELE-15113DCE	Programming and Problem Solving Techniques	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-I

Generic Electives

Course Code	Course Title	L	T	P	Credits
ELE-15114GE	Engineering Mathematics	2	1	0	2+1
ELE-15115GE	Signals and Systems	2	0	2	2+1
ELE-15116GE	CMOS VLSI and Nano-Electronics –I (MOSFET Theory)	2	0	2	2+1
ELE-1517GE	Data and Computer Communication	2	0	2	2+1
ELE-15118GE	Programming and Problem Solving Techniques	2	0	2	2+1
ELE-15119GE	Electronics Engineering Materials and Components	2	0	2	2+1
ELE-15120GE	Statistical Communication Theory	2	0	2	2+1
ELE-15121GE	Instrument Fabrication and Maintenance	2	0	2	2+1
ELE-15122GE	Opto-Electronic Devices	2	0	2	2+1

Open Electives

Course Code	Course Title	L	T	P	Credits
ELE-15119OE	Computing and Informatics–I	1	0	2	1+1
ELE-15120OE	Basic Electrical and Electronics Engineering	1	0	2	1+1

Course: M.Sc. (Electronics)					SEMESTER-II	
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-15201C	Analog Communication Systems	Core	2	0	2	2+1
ELE-15202C	Microprocessor, Architecture, Interfacing and Programming	Core	2	0	2	2+1
ELE-15203C	Power Electronic Circuits and Systems	Core	2	0	2	2+1
ELE-15204C	Microwave Engineering	Core	2	0	2	2+1
ELE-15205DCE	VLSI Technology	DCE	2	1	0	2+1
ELE-15206DCE	Optical Communication and Networks	DCE	2	0	2	2+1
ELE-15207DCE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	DCE	2	0	2	2+1
ELE-15208DCE	Design and Analysis of Active Filters	DCE	2	0	2	2+1
ELE-15209DCE	Simulation and Modeling using MATLAB	DCE	2	0	2	2+1
ELE-15210DCE	Data Structures	DCE	2	0	2	2+1
ELE-15211DCE	Wireless Adhoc and Sensor Networks	DCE	2	0	2	2+1
ELE-15212DCE	Communication Hardware Design	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-II

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15213GE	VLSI Technology	2	1	2	2+1
ELE-15214GE	Optical Communication and Networks	2	0	2	2+1
ELE-15215GE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	2	0	2	2+1
ELE-15216GE	Design and Analysis of Active Filters	2	0	2	2+1
ELE-15217GE	Simulation and Modeling using MATLAB	2	0	2	2+1
ELE-15218GE	Data Structures	2	0	2	2+1
ELE-15219GE	Wireless Adhoc and Sensor Networks	2	0	2	2+1
ELE-15220GE	Advanced Programming	2	0	2	2+1
ELE-15221GE	Communication Hardware Design	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15222OE	Computing and Informatics –II	1	0	2	1+1
ELE-15223OE	Basic Electronic Devices and Circuits	1	0	2	1+1

Course: M.Sc. (Electronics) SEMESTER-III

Course Code	Course Title	Category	L	T	P	Credits
ELE-15301C	Physics of Semiconductor Devices	Core	2	1	0	3
ELE-15302C	Control Systems Engineering	Core	2	0	2	2+1
ELE-15303C	Digital Signal Processing	Core	2	0	2	2+1
ELE-15304C	Computer Networks	Core	2	0	2	2+1
ELE-15305DCE	Microcontrollers, Architecture, Interfacing and Programming	DCE	2	0	2	2+1
ELE-15306DCE	Advanced Communication Systems	DCE	2	0	2	2+1
ELE-15307DCE	Digital System Design using HDL	DCE	2	0	2	2+1
ELE-15308DCE	Speech and Audio Processing	DCE	2	0	2	2+1
ELE-15309DCE	CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design)	DCE	2	0	2	2+1
ELE-15310DCE	RF Engineering	DCE	2	0	2	2+1
ELE-15311DCE	Microwave Integrated Circuits (MICs)	DCE	2	0	2	2+1
ELE-15312DCE	Soft Computing and Neural Networks	DCE	2	0	2	2+1
ELE-15313DCE	Coding Theory	DCE	2	0	2	2+1
ELE-15314DCE	Cryptography and Information Security	DCE	2	0	2	2+1
ELE-15315DCE	Advanced Microprocessors	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-III

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15316GE	Microcontrollers, Architecture, Interfacing and Programming	2	0	2	2+1
ELE-15317GE	Advanced Communication Systems	2	0	2	2+1
ELE-15318GE	Digital System Design using HDL	2	0	2	2+1
ELE-15319GE	Speech and Audio Processing	2	0	2	2+1
ELE-15320GE	CMOS VLSI and Nano Electronics –III (Analog and Mixed IC Design)	2	0	2	2+1
ELE-15321GE	RF Engineering	2	0	2	2+1
ELE-15322GE	Microwave Integrated Circuits (MICs)	2	0	2	2+1
ELE-15323GE	Soft Computing and Neural Networks	2	0	2	2+1
ELE-15324GE	Coding Theory	2	0	2	2+1
ELE-15325GE	Cryptography and Information Security	2	0	2	2+1
ELE-15326GE	Advanced Microprocessors	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15327OE	Electronic Equipment and Maintenance	1	0	2	1+1
ELE-15328 OE	Basic Radio and TV Engineering	1	0	2	1+1

Course: M.Sc. (Electronics)			**SEMESTER-IV**			
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
ELE-15401C	Digital Communication and Information Theory	Core	2	0	2	2+1
ELE-15402C	Electronic Instrumentation	Core	2	0	2	2+1
ELE-15403C	Industrial Training and Seminar Work	Core	0	1	4	1+2
ELE-15404C	Project Work	Core	0	0	8	4
ELE-15405DC	Computer Organization and Architecture	DCE	2	0	2	2+1
ELE-15406DCE	Multimedia Technology and Security	DCE	2	0	2	2+1
ELE-15407DCE	Mobile Communication	DCE	2	0	2	2+1
ELE-15408DCE	CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano Electronics)	DCE	2	0	2	2+1
ELE-15409DCE	Fundamentals of RF Circuit Design	DCE	2	0	2	2+1
ELE-15410DCE	Bio-Medical Instrumentation	DCE	2	0	2	2+1
ELE-15411DCE	Digital Image Processing	DCE	2	0	2	2+1
ELE-15412DCE	Parallel Computation and Architecture	DCE	2	0	2	2+1
ELE-15413DCE	Cyber Security and Forensics	DCE	2	0	2	2+1
ELE-15414DCE	Broadband Wireless Networks	DCE	2	0	2	2+1
ELE-15415DCE	Embedded System Design	DCE	2	0	2	2+1
ELE-15416DCE	Modeling and Simulation of Wireless Communication Systems	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-IV

Generic Electives

Course Code	Course Title	L	T	P	Credits
ELE-15417GE	Computer Organization and Architecture	2	0	2	2+1
ELE-15418GE	Multimedia Technology and Security	2	0	2	2+1
ELE-15419GE	Mobile Communication	2	0	2	2+1
ELE-15420GE	CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano Electronics)	2	0	2	2+1
ELE-15421GE	Fundamentals of RF Circuit Design	2	0	2	2+1
ELE-15422GE	Bio-Medical Instrumentation	2	0	2	2+1
ELE-15423GE	Digital Image Processing	2	0	2	2+1
ELE-15424GE	Parallel Computation and Architecture	2	0	2	2+1
ELE-15425GE	Cyber Security and Forensics	2	0	2	2+1
ELE-15426GE	Broadband Wireless Networks	2	0	2	2+1
ELE-15427GE	Embedded System Design	2	0	2	2+1
ELE-15428GE	Modeling and Simulation of Wireless Communication Systems	2	0	2	2+1

Open Electives

Course Code	Course Title	L	T	P	Credits
ELE-15429OE	Automobile Electronics	1	0	2	1+1
ELE-15430OE	Electronics for Hobbyists	1	0	2	1+1

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER I

Course No. ELE-15101C **Circuit Analysis and Synthesis**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Graph Theory and Network Equations

Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Isomorphism, Network Matrices, Incidence Matrix, Loop Matrix, Fundamental Loop, Cut -Set Matrix, Fundamental Cut Set, Relationship between Matrices, Fundamental Loop Mesh Equations, Nodal equations, Nodal Admittance, Source Transformations, Tellegen‟s Theorem and its Applications.

Unit II: Two Port Parameters

Various Two Port parameters, O. C. Impedance and S. C. Admittance Parameters, parameters, chain Parameters, Image Impedance, Applications of various Two port Parameters to T and π networks, Relationship between different two port parameters, Interconnection of Two port equivalent networks.

Unit III: Network Functions and Responses

Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Poles, Zeros and Frequency response, Physical interpretation of Poles and Zeros, Oscillatory response of Poles and Zeros, Basic consideration in writing state variable equations for electrical Network, Formulation of state equations for Electrical Networks and their solutions.

Unit IV: Passive Network Synthesis

Introduction to passive network synthesis, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immittance Functions *(realized by Foster-I and Foster II form, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC Admittance Functions.

Laboratory Work:

Verification of Source Transformation and TellegensTheorms, Calculation of various two port parameters, To study impulse response of a first order system, To study oscillatory response and its relation with pole location. Synthesis of some passive networks

Books Recommended:

1. Networks and Systems by D.R.Choudury, Wiley Eastern Ltd: New Delhi.
2. Network Analysis By M. E. Valkenburg , Prentice Hall India.
3. Basic Circuit Theory by Charles A. Desoer and Ernest S. Kun, McGraw H
4. Circuit Analysis with Computer Application to Problem Solving by Gupta, BaylessandPiekari, Willey Eastern Ltd, New Delhi
5. Network Analysis theory and compute methods by donson and Watkins, Prentice Hall,New Delhi.

Course No.: ELE-15102C **Antennas and Wave Propagation**
Paper Type: Core **Credit: 2L+0T+2P**

Unit I: Maxwell's Equations

Review of Electromagnetics and EM spectrum,Maxwell"s Equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Displacement current (Physical interpretations), Time varying field equations Boundary condition, Surface Charge and Surface Current, Boundary Conditions at media interface (Dielectric and Conducting interface). some experiments using Antenna Trainer and CST Tool

Unit- II: Electromagnetic Waves

Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, wave propagation in conducting medium, power flow and pointing vector (Physical interpretation), plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface. Some experiments on Antenna Trainer and CST Tool

Unit- III: Antenna Radiation Mechanism

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna. Some experiments on Antenna Trainer and CST Tool

Unit- IV: Practical Antennas

Folded dipole antennas, modification of folded dioples, loop antennas, far- field patterns of circular loop antennas, horn antennas, reactangular horn antennas, , introduction to microstrip antennas, some experiments using Microwave Antenna Trainer and CST Tool

Laboratory Work:

Measurement of Antenna Parameters using Microwave Antenna Training System, Plot of Polarization (Horizontal and Vertical).Design of dipole antenna system using waveguide.some experiments using Microwave Antenna Trainer and CST Tool.

Books Recommended:

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition
2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill

Course No.: ELE-15103C **Linear Integrated Circuits and Applications**
Paper Type: Core **Credit: 2L+0T+2P**

Unit I: Operational Amplifier characteristics Applications

Differential Amplifier, Emitter coupled differential Amplifier, Transfer characteristics of differential Amplifier, Current Mirrors, Active Loads, Non- ideal parameters of OP- AMPs, Frequency response of OP- Amps, Compensation, Pole – Zero compensation, Dominant pole compensation, Lead compensation, Linear Applications of Op-amps: Amplification (Inverting Amplifier, Non-inverting Amplifier, Instrumentation Amplifier),

Unit II: Operational Amplifier Systems

Integration and Differentiation; Electronic analog computation, Active filters, Sample and hold systems, Analog multiplexer, Logarithmic and Exponential amplifiers, Voltage-to-Frequency and Frequency-to-Voltage Converters, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation).

Unit III: Wave shaping and Wave generators

Rectifiers, Clippers and Clampers, Peak Detector, Comparators, Applications of comparators, Schmitt-trigger, Square wave and triangular wave generators, pulse generators, voltage time-base generators, Step (Stair-case) generators, sinusoidal Oscillators: Phase shift oscillator, Wien-bridge oscillator,

Unit IV: Timer, PLL and Voltage Regulators

555 timer: Applications as Astable and MonostableMultivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, PLL motor speed control, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Op-Amp Characteristics, Linear applications; Wave shaping, signal generation, PLL and 555 timer.

Books Recommended:

1. Milliman, Integrated Electronics, McGraw hill Book company
2. Milliman and Grabel, Microelectronics, McGraw Hill Company
3. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Mc-Graw Hill, 2002.
4. R. A. Gayakward , OP- Amp and Linear Integrated Circuits, Prentice Hall of India Ltd.

Course No.: ELE-15104C **Digital Electronics and C Programming Lab**
Paper Type: Core **Credit: 0L+1T+4P**

Note: Students are required to conduct at least 15 Practicals selecting at least 7 from each Unit.

Unit 1: Experiments on Digital Electronics:

S. No		***Title of Experiment***
1.		To design basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) using discrete components.
2.		To design basic logic gates (AND, OR, NOT) using universal gates.
3.		To verify Boolean expressions using basic and universal gates.
4.		To design and realize Half and Full Adder Circuits using basic logic gates/universal gates.
		To design a 4-bit magnitude comparator using basic/universal logic gates.
5.		To design a digital clock using IC‟s.
	(a)	To design a 4:1 multiplexer and 1:4 de-multiplexer circuits using basic/universal logic gates.
6.	(b)	To implement a 4/5 variable Boolean function using a suitable MUX.
	(a)	To design a 2^n to n line encoder using basic universal logic gates.
7.	(b)	To design a control signal generator for 2^n :1 MUX and 1: 2^n DEMUX using decoder.
	(a)	Design a BCD to 7 segment decoder using IC‟s (7447).
8.	(b)	To design a circuit that can encode a particular sequence and decode the same sequence.
	(a)	To design a ROM that can store a particular sequence.
9.	(b)	To implement a 4/5 variable Boolean function using ROM and decoders.
	(a)	To design the following flip-flops using universal gates. I) S-R flip-flop II) D flip-flop III) J-K flip-flop and IV) T flip-flop
10.	(b)	Study race around condition of J-K flip-flop and design edge-triggered J-K-flip flop and M/S flip-flop to eliminate race around condition.
11.	(a)	To design an n-bit serial adder using full adder and D type flip flop IC‟s.
	(b)	To design a universal shift register and demonstrate SISO, SIPO, PISO and PIPO functions.
12.	(a)	To design a modulo-n Asynchronous and synchronous counter using JK/T-Flip Flop IC‟s.
	(b)	To design an up-down synchronous counter with direction control that can count a particular sequence.
	(c)	To design Jhonson& Ring counter.

Unit II: Programming with C Language

S. No ***Title of Experiment***

1. a) Write a program to evaluate the sine series using the following formulas:

$$sin\,(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots\ldots\ldots\ldots$$

$$sin\,(x) = \sum_{n=0}^{\infty} \frac{[(-1)n * x(2n+1)]}{(2n+1)!}$$

Use recursive and non-recursive functions.

2. Write down and execute a C-Programme for the following:

a) To determine the value of a given Resistor from its color Code.
b) To match a frequency with the various divisions of the frequency spectrum and display its location.
c) To check whether a transistor is NPN or PNP.
d) To accept the name of a transistor and output the package type, manufacturer, operating frequency range, and material used.

- e) To accept parameters of a transformer and calculate its output voltage.
- f) To accept one of the three parameters (peak voltage, average and rms) of a signal and calculate the other two parameters in half-wave and full-wave rectifier along with ripple factor.
- g) To accept the changes in the current IB, IC, and IE of a transistor and calculate the current amplification factors in cases of common-base, common-emitter, and common-collector amplifiers.
- h) To calculate the extreme points of a load line and operating point using the given parameters.
- i) Current flowing through a Semiconductor diode is given by

$$I_D = Is[\exp(v_D/nv_{th}) - 1]$$

Where VD is Voltage across diode, Is is saturation current, n is Emission coefficient and Vth is Thermal voltage. Write a program to calculate and plot the current flowing through the diode for voltages from –4.0 Volts to 1.0 Volts in steps of 0.1.

3. a) Write down a program which will convert a decimal number to its equivalent representations in hexadecimal, octal and binary number systems. The program should display the number in all of above number systems.

b) Write a C program that converts a decimal number to its equivalent number in new base. The decimal number and the new base are to be read as command line arguments.

4. Write down a program to compute

a) Equivalent resistance of the resistors connected in
I). Series, II). Parallel.

b) Equivalent capacitance of the capacitors connected in
I). Series, II). Parallel.

c) Equivalent inductance of the inductors connected in
I). Series, II). Parallel.

5. a) Write down a program to calculate the output voltage for Damped Sinusoidal Oscillator.

b) Write down a program to calculate the oscillating frequency of a damped RLC circuit.

c) Calculate the energy stored in an inductor which is given by:

$$E = \tfrac{1}{2} \times \text{inductance} \times \text{current } 2$$

6. Write down a program to calculate the total percentage Harmonic Distortion of a device for the given strengths of fundamental and harmonic components.

7. Write a program to accept the color code of resistors and sort them in ascending or descending order of their values using arrays.

8. Write a program to read a string and a key. Encrypt the string using this key. Display the encrypted string. In the same program read the key again decrypt the string and display the original string using functions.

9. Write a computational program for solving simultaneous algebraic equations by Guassian Elimination method and use it for solving a given linear network.

Books Recommended:

1. Malvino and Leach “Digital principles and Applications” Tata McGraw Hill.
2. Jain R P “Modern Digital Electronics”, Tata McGraw-Hill, Third Edition, (2003)
3. Mano M Morris, “Digital Design” Pearson Education, Third Edition, (2006)
4. Deitel, “C How To Program”
5. Byron Gottfried "Programming with C”
6. E. Balaguruswamy, "Programming with ANSI-C"
7. A. Kamthane, "Programming with ANSI & Turbo C"

Course No.: ELE-15105DCE/ELE-15114GE **Engineering Mathematics**
Paper Type: DCE/GE **Credits: 2L+1T+0P**

Unit I: Fourier Transform

Dirichlet's Condition, Determination of Fourier Coefficients, Fourier Series for arbitrary period, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals, Fourier Transforms: Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit II: Laplace Transformation

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform in Electrical Networks.

Unit III: Function of Complex Variable

Analyticity of Complex variables, Cauchy Riemann Conditions, Cauchy integral Theorem, Laurent's Series, Singularities, Poles, Residues, Residue Theorem, Contour integration for Trigonometric functions (0 to 2π) , Contour Integration for functions ($-\infty$ to $+\infty$), Application of Functions of Complex variables in System Stability. Bessel and Legender Polynomials.

Books Recommended:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.
4. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A.Fairley, John Wiley & Sons
5. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.
6. Statistical Methods by S. P. Gupta, S Chand and Company.
7. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH
8. Fourier Transformation and Laplace Transformations, Schaum Series Book ,TMHCourse

Course No.: ELE-15106DCE/ELE-15115GE **Signals and Systems**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to Signals and Systems

Representation and Classifications of Continuous and Discrete Time Signals and Systems; Fourier Series Representation; Singularity Functions; Convolution Integral; Impulse Response and Its Properties.

Unit II: Transform Techniques

Fourier Transform and Its Properties; Hilbert Transform; Review of Laplace Transform; Sampling; Z-Transform and Its Properties; Discrete Time Fourier Transform; Discrete Fourier Transforms.

Unit III: Analysis Using Transforms

System Analysis Using Fourier and Laplace Transforms of I & II Order Systems; Transfer Function; Feedback Systems; Block Diagram & Signal Flow Graph Techniques; Discrete Time System Analysis Using Z-Transform.

Unit IV: Random Signals

Review of Random Variables; Probability Distribution and Probability Density Functions; Uniform, Gaussian, Exponential and Poissan Random Variables; Statistical Averages; Random Processes; Correlation; Power Spectral Density; Analysis of Linear Time Invariant Systems With Random Input; Noise and Its Representations

Laboratory Work:

Generation of various signals and sequences using MATLAB.Computation of Correlation and convolution of various signals using MATLAB. Fourier Transform and DFT computation, Study of sampling and quantization. Study of PSD of various signals.System solutions.

Books Recommended:

1. Alan V, Oppenheim and A.S Wilsky, Signals and Systems, prentice Hall India
2. Simon Hykin, Signals and systems, John Wiley.
3. B. P Lathi, Signals and systems,
4. Simon hykin, Communication systems, John wiley.

Course No.: ELE-15107DCE/ELE-15116GE **CMOS VLSI and Nano-Electronics-I (MOSFET Theory)**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: MOSFET Operation

Long Channel MOSFET devices: Drain current model, MOSFET I-V characteristics, Regions of operation, sub-threshold characteristics, MOSFET channel mobility, MOSFET capacitance and inversion layer capacitance effect, MOSFET parasitic elements. MOS transistor with Ion-Implanted channels: Enhancement n-MOS transistors, Depletion n-MOS transistors, Enhancement p-MOS transistors.

Unit II: Threshold Voltage and Small Channel Effects

Threshold Voltage: Threshold variation with device length and width and temperature dependence of threshold voltage. Small channel effects: Channel length modulation, barrier lowering, two dimensional charge sharing and threshold voltage, Punch Through, Carrier velocity saturation, Hot carrier effect-substrate current, gate current and breakdown, effect of surface and drain series resistance, effects due to thin oxides and high doping.

Unit III:MOSFET Scaling and Parasitics

Scaling theory in MOSFETs: Effect of scaling theory on drain current, device capacitances, delay, power dissipation, Transconductance and output impedance.VLSI device structure: Gate material, non-uniform channel doping, source drain structures, device isolation, MOSFET parasitic elements, MOS capacitor with no applied voltage and at non-zero bias.

Unit IV: MOS Modeling, Layout and Simulation

SPICE Modeling of the MOSFET: long and short channel modeling, Introduction to Processing and Layout, An Introduction to PSPICE, Generating a Netlist File, PSPICE Schematics, Circuit description, DC circuit analysis, Transient analysis, AC circuit analysis

Laboratory Work:

The laboratory work shall include minimum 10 practicals on MOSFET characteristics, Modelling and PSPICE

Books Recommended:

1. N. Arora, MOSFET Models for VLSI Circuit Simulation, Springer-Verlag Wien New York.
2. Yuan Taur and Tak H. Ning, Fundamentals of modern VLSI Devices, Cambridge University Press.
3. YannisTsividis, Operation and Modeling of MOS transistor, WCB/McGraw-Hill, New York.

Course No.: ELE-15108DCE/ELE-15119GE **Electronic Engineering Materials & Components**

Paper Type: DCE/GE **Credits: 2L + 0T + 2P**

UNIT-I: Electrical Properties of Materials
Classification of electrical materials; Fundamentals of Atomic Structure and Chemical Bonding; Structure and properties of conductors, semi-conductors and insulators;

UNIT-II: Magnetic Properties of Materials
Structure and properties of magnetic materials, ferroelectric, piezo-electric, ceramic optical and superconducting materials.Structure of solids : Crystalline and Non-crystalline states; Crystallographic directions and phases; Determination of crystal structures.

UNIT-III: Electronic Components
Passive components; Resistors, capacitors, inductors and their types; color coding; ferrites, Quartz crystal and ceramic resonators, electromagnetic and electromechanical components.

UNIT IV: Physical Electronics
Electrons and holes in semiconductors; Hall effect; mechanism of current flow in a semi-conductor, junction theory, different types of diodes and their characteristics (rectifying, Zener, LED, Photo). Introduction to three terminal devices (BJT and FET).

Laboratory Work:

The students are required to conduct at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. Electronic Devices and Circuit Theory. By: Robert Boylestad& Louis Nashelsky. Prentice Hall.
2. Elements of Materials Science & Engineering. By: L.H. Van Vlack. Addison-Wesley Publishing Company, New York.

Course No. ELE-15109DCE/ELE-15120GE **Statistical Communication Theory**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Random Variables

Discrete Time Random Processes: Random Variables, Ensemble Averages, Jointly distributed random variables, Uncorrelated and Orthogonal Random Variables, Linear Mean Square Estimation.

Unit II: Random Process and Statistical Properties

Gaussian Random Variables, Parameter Estimation: Bias and Consistency, Random Processes, Stationary Processes, Autocovariance and Autocorrelation, Ergodicity, Power Spectrum.

Unit III: Filtering

Filtering Random Processes: Spectral factorization, Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalman filter.

Unit IV: Adaptive Filtering

Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay‟s estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Laboratory Work:

Matlab Implementation and study of Filtering Random Processes: Spectral factorization, Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalmanfilter.Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay‟s estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Books Recommended:

1. An introduction to statistical communication theory, David Middleton, McGraw-Hill, 1960
2. An Introduction to Statistical Communication Theory: An IEEE Press Classic Reissue.DavidMiddletonWiley, 08-May-1996 - Technology & Engineering - 1152 pages

Course No.: ELE-15110DCE/ELE-15121GE **Instrument Fabrication and Maintenance**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit-I: Transformers, UPS and Batter ies

Transformers: Single-Phase Transformers, Construction, Types, Transformer ratio, Cooling, Auto Transformer, Transformer Tests, Efficiency of Transformer, Transformer winding, auto cuts and line protection. Three phase transformers - connections, parallel operation. Fabrication and repairs of Transformers. UPS: Principle and operation, performance parameters, capacity, Repairs of UPS. Rechargeable Batteries: Principle, types, capacity, AH rating. Fabrication and repairs of batteries.

Unit-II: Generators, Motors and other Appliances

DC/AC Generators: Magnetic induction, Principle, Torque Equation, Main Parts, Types, Application. Motor Winding, Fan Winding, Repairs of DC/AC Motors, Generators & Fans. Repairs of Xerox Machines, FAX Machines &Telephone equipment. Repairs of Washing Machines.

Unit-III: Assembling and maintenance of Computers

Assembling of a computer system, Hardware maintenance of a computer system, memory upgradation, software faults. Maintenance of printers and other computer accessories.

Unit-IV: Mobile Phone, Maintenance and Repair

Mobile phones: Introduction to Mobile Phones, Computerized Chip Level Mobile Repairing, IC Replacement and Rebolling, methods of Flashing, Mobile Unlocking, Mobile Formatting, UI Settings. Mobile Downloading, Blue-Tooth & Card-Reader Cables.

Laboratory Work:

Practical exercises on fabrication of power transformers, transformer winding, UPS assembling, repairs of Xerox machines, Fax machines. Practical exercises on repairs of mobile phones.Assembling of computer system and memory upgradation.

Books Recommended:

1. “Engineering Fundamental and Problem Solving” by Eide, et. al., 2002, John Wiley & Sons.
2. Manuals for Transformer and motor winding
3. Manuals for UPS, Mobile Phones, Bio-medical equipment.
4. Computer Assembling and maintenance manuals.

Course No.: ELE-15111DCE/ELE-15122GE **Opto-electronic Devices**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Light Sources

Black body radiation sources of light and their spectral characteristics. Interaction of radiation with matter, photo conductivity, photo detectors and their figures of merits, PIN and APD diodes and their temperature dependence.

Unit II: Solar Cells

Solar Cells, luminescence and their uses, Image Intensifier, light amplifiers. Display devices. Optical sources, LCD, LED optocouplers. TV camera and Photo-transistor, Photo SCR

UnitIII: Lasers

Theory of stimulated emission and optical oscillator in solid state Semiconductor, dye lasers.Laser Diode, Nonlinear optical effect. Propagation characteristics of optical fibre

UnitIV: Materials for Dielectric Waveguides

Material and wave guide dispersions. Modulation and detection of optical signals, nonlinear propagation and interaction, organic and inorganic optical wave guides, fibre amplifiers, integrated optical devices

Laboratory Work:

Characteristics of LED, Characteristics of LD Characteristics of PD & APD Optical Time Domain Reflectometer (OTDR) Kerr effect Pockel"s effect Spectral characteristics of LED and LD Wavelength division multiplexing of signals, Fiber-Optic System Bandwidth estimation, Single Mode Fiber Characteristics

Books Recommended:

1. J. Wilson & J.F.B. Hawkes, “Optoelectronics – An Introduction”, Prentice Hall, India, 1996.
2. P. Bhattacharya, “Semiconductor optoelectronic devices”, Second Edn Pearson Education,Singapore, 2002.

Course No.: ELE-15112DCE/ ELE-15117GE **Data and Computer Communication**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

Data representation and flow, Analog and Digital Data, Analog and Digital Signals, Periodic Analog Signals (Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth), Digital Signals (Bit Rate, Bit Length), Digital Signal as a Composite Analog Signal, Transmission of Digital Signals, Transmission Impairment (Attenuation, Distortion, Noise), Data rate limits (Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity), Performance Parameters, Digital Transmission: Digital to Digital Conversion, analog to digital conversion, transmission modes), Analog Communication: Digital to Analog Conversion, Analog to Analog Conversion). Introduction to multiplexing and spectrum spreading.

Unit II: Transmission Media and Switching

Guided media (Twisted pair cable, coaxial cable, fiber-optic cable), unguided media (radio waves, microwaves, infrared), Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet- Switching Principles, X.25, Frame Relay.

Unit III: Error Detection and Correction

Types of errors, Redundancy, Detection versus Correction, Coding, error detection, Cyclic Redundancy Check, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes, Hardware Implementation, checksum, Forward error correction using Hamming distance, XOR, Chunk Interleaving, etc.

Unit IV: Introduction to Protocol Architecture

The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data Link Control: Framing, Flow and Error Control, Introduction to DLC protocols, High-Level Data Link Control (HDLC), Point-to-Point Protocol (PPP), and Media Access Control.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. B. A. Forouzan, Data Communications and Networking, TMH.
2. William Stallings, Data and Computer Communications, 10/E, Pearson.
3. P.C. Gupta – Data Communications and Computer Networks, PHI.

Course No.: ELE-15113DCE/ELE-15118GE **Programming and Problem Solving Techniques**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation, Algorithms for Problem Solving - Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate „sin x‟ as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

Unit II: Basic Programing Constructs of C/C++ Programming Language

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, assignment and Basic input/output statement, Conditional Statements and Loops - Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if else statement, while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming. One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices,

Unit III: Functions, Structures and Pointers

Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments, Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Pointers-Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.

Unit IV: File Processing and Object Oriented Programming in C++

Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file, Object Oriented Programming Concepts, Classes, Encapsulation, Member Functions, Constructors, Destructors, Inheritance and its types, Function and Operator Overloading, Abstract Class, Function Overriding, Dynamic Binding, Virtual Functions, Exception handling.

Laboratory Work:

The laboratory work shall be based on Unit I to Unit IV. It shall include writing C/C++ programs for Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate „sin x‟ as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluation of Polynomials, programs using structures and pointers, File processing, programs for solving engineering problems. The lab work shall be carried through Borland C/C++, GCC, NetBeans, Eclipse and Visual Studio.

Books Recommended:

1. Deitel, "C How To Program", 2. Byron Gottfried "Programming with C", 3. E. Balaguruswamy, "Programming with ANSI-C", 4. A. Kamthane, "Programming with ANSI & Turbo C", 5. Herbert Schildt C++-The Complete Reference.

Course No.: ELE-15119OE **Computing and Informatics – I**
Paper Type: OE **Credits: 1L+0T+2P**

Computer basics.History, generations and classification of computers; Number systems; Hardware. Components of a computer input/output devices, CPU unit and memory unit, secondary storage. Software, System software; application software; compilers and translators.Operatingsystems.Introduction to operating systems;' types of operating systems and their functions; popular operating systems- Linux, UNIX and Windows, Introduction to office automation and Internet.

Laboratory Work:

Identification of various internal and external parts of computer system, connecting various parts of computer system, learning basic commands for file management on windows operating system, learning to create, format and print documents, spreadsheets and presentations, Internet and applications.

Recommended Books:

1. V. Srivastava "Computing and Informatics" IstEdition S. K. Kataria& Sons.
2. Chandwani "Computing and Informatics" Jain Brothers.
3. AnitalGoel "Computer Fundamentals" Pearson
4. P.K.Sinha "Computer Fundamentals" BPB Publications.

Course No.: ELE-151120OE **Basic Electrical and Electronics Engineering**
Paper Type: OE **Credits: Credits: 1L+0T+2P**

Basic Electrical and Electronics Engineering

Conductors, insulators, Semiconductors, Voltage, current, resistance, Ohm's Law, Classification of resistors, Specifications & use. Color Code.
Voltage and Current sources, concept of AC/DC. Signal Waveforms, Amplitude, frequency, wavelength. Spectrum and bandwidth.
Networks and circuits, Kirchhoff‟s current law (KCL) and Kirchhoff s voltage law (KVL), Capacitance & capacitive reactance. Classification of capacitors, dielectric constants, materials used. Series and parallel connection. Colour code and application. Inductance, self and mutual inductance, Resonance, Concept of generators & motors. Instantaneous values, R.M.S. values, phase-cycle.
Transformers, step-up and step down, turns ratio and wire guages, efficiency.
Measurement: Meter, Ammeter, Voltmeter, Ohmmeter, Power Supply, Multimeter, Introduction to CRO.
Semi-conductor, Intrinsic & Extrinsic Semiconductors. Temperature co-efficient. Definition of „P‟‟ and „N‟‟ types of semiconductor, PN Junction, Junction-Barrier potential. Diode, Rectifiers: Half wave-Full wave bridge. Introduction to BJT, Transistor action, Biasing, Transistor as switch and Amplifier.

Lab Work:

Resistance calculation using color code, Ohms Law, KCL and KVL, Series and Parallel combination of Resistors and capacitors. Measurement Time period, Frequency and RMS value and Average value of a sinusoid. Current, voltage and resistance measurement using multimeter. Half wave and full wave rectification.

Books Recommended
1. Del Torro, “Electrical Engineering Fundamentals”, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi (1994)
2. W.H. Hayt and J.E. Kemmerly, “Engineering Circuit Analysis,” Mc-Graw Hill Delhi (1996).

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER II

Course No. ELE-15201C **Analog Communication Systems**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Amplitude Modulation/Demodulation Techniques
Introduction to Signals and its classification**,** Properties of Signals and Noise,**:**Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of Amplitude Modulation, Double Side band Suppressed Carrier, (DSB- SC) System: Mathematical Analysis, Generation and Demodulation of DSB- SC signals, Costas receiver.

Unit II: Single Side Band Modulation
Advantages of SSB transmission, Hilbert Transform, properties of Hilbert transform, pplications of Hilbert Transform, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and receiption.

Unit III: FM Modulation/ Reception
Concept of Angle Modulation: Mathematical theory, Phasor Representation of Angle modulated signal, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission. FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, Foster Selay or Phase Discriminator, FM Detector using PLL and Stereo FM Multiplex Reception.

Unit IV: Performance of Analog Communication Systems
Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise equivalent Band-width, Effective Noise temperature, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Laboratory Work:
Study of ICs (AD633/AD734), Design and realize AM modulator using Square Law modulator and calculate its modulation index and power, design and realize AM detector using Square Law detector and Envelope detector, design and realize DSB-SC signal Modulator using Analog Multiplier, design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop, Simulation of SSB-SC modulator and demodulator using MATLAB/Simulik, Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink.Derivation of modulation index in case of FM signal, to design and realize FM generation and Detection, To study & realize Op-amp based Pre-Emphasis & De-Emphasis circuits.
Field study/ Visit to Radio Kashmir Srinagar.

Books Recommended:
1. Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.
2. George Kennedy, "Electronic Communication System", McGraw- Hill.
3. Gary M. Miller and Jeffery S. Beasley, "Modern Electronic Communications ", PHI.
4. Simon Haykin, " Communication Systems", 8th edition, Wiley Pubclishers.
5. Wayne Tomasi, " Electronics Communication systems", 4th edition, Pearson Publishers.

Course No. ELE-15202C — **Microprocessor, Architecture, Interfacing and Programming**

Paper type: Core — **Credits: 2L+0T+2P**

Unit 1: Architecture, Addressing Modes, Instruction Set and ALP

Introduction to Microprocessors, Introduction to Intel Processors, Various emerging trends in Microprocessor Design. 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU and EU, Working of 8086 Microprocessor, Registers of 8086 Microprocessor and their purpose, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor based systems.

Unit II: Assembly Language Programming

Introduction to Programming, Various level of Programming, Assembly language programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions, Assembly language Programming for 8086 microprocessor. Use of Macros in ALP.

Unit III: Interrupts, Timing and Processor Modes

Introduction to procedures, interrupts and interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts, Software Interrupts, Hardware Interrupts, Multiple Interrupts, ALP using interrupts, 8259 Programmable Interrupt Controller-Features, Interfacing & Programming, Various Types of 8086 microprocessor, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum Mode 8086 System, 8288 Bus Controller, Maximum Mode 8086 System.

Unit IV: Peripheral Devices and Interfacing

Peripheral Devices and Interfacing, Introduction to memory and its types, Memory interfacing, Memory mapped and I/O Mapped Schemes, Even and Odd Addressing. Data Transfer Schemes, I/O Interfacing, Isolated and Memory Mapped I/O instructions, Ports. Study of Peripheral chips: Features, Block Diagram, Control & Status Registers, Operating Modes, Interfacing & Programming of 8255 Programmable Peripheral Interface, 8257 Programmable DMA controller, 8254 Programmable Interval timer, Introduction to DAC0830 Digital to Analog Converters, ADC0804 Analog to Digital Converters, 8279 Keyboard and Display Controller, and 8251/16550 (USART).

Laboratory Work:

The Laboratory work shall be based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Introduction to 8086, 80186, 80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company.
2. Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company.
3. Microprocessor and x86 Programming, V. R. Vengopal, McGraw Hill Publishing Company.
4. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by W. A. Treibel and Avtar Singh, Prentice Hall.
5. Microprocessors and Interfacing Programming and Hardware, D. Hall, TMG.
6. Microprocessor 8086 Architecture, Programming and interfacing by Sunil Mathur. PHI.

Course No. ELE-15203C **Power Electronic Circuits and Systems**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Power Devices

Review of switching characteristics of semiconductor devices *(Power diodes, BJT's,),* Characteristics of an ideal switch, Types of electronic switches. Thyristor construction and characteristics, Methods of turning ON, Turn-off mechanism, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC and UJT V-I characteristics.

Unit II: Thyristor Circuits and Applications

Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Commutation techniques: Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit III: Switch Mode DC to DC Power Converters

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Half-Bridge converter, Push Pull converter and Full Bridge converter.

Unit IV: Inverters and Cyclo-converters

Inverter: Principle of operation, performance parameters, Pulse width modulation techniques,
Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down , design of single-phase step down Cycloconverters , Power supplies: SMPS, UPS.

Laboratory Work:

Verify switching action of a Power BJT and MOSFET, IV characteristics of SCR, DIAC, TRIAC and UJT. Calculation of Holding and latching currents of SCR, To study various Commutation Techniques, Design of BUCK, BOOST and BUCK-BOOST converter.

Books Recommended:

1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.
3. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.
4. Introduction to Thyristors and their Applications, by M. Ramamorty .

Course No. ELE-15204C **Microwave Engineering**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Microwave Transmission Lines

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Standing wave and Standing wave ratio, Impedance matching by Stubs and Tapped Quarter wave line-transformer, Short circuited line, Open circuited line, Line terminated by arbitrary load.

Unit II: Micro wave Waveguides and Components

Fundamentals of Microwave Waveguides, Rectangular Waveguides, TE & TM modes in Rectangular magnitudes, excitation of modes in Rectangular Wave guides, Degenerative & dominant modes, S-Parameters: Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee , Magic tee, hybrid rings (rat-race circuits), directional Couplers, S-Matrix of direction Coupler, Circulators and isolators.

Unit III: Microwave Amplifiers & Oscillators

Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation, Microwave Cavity Resonators, Klystrons: Multicavity Klystron and Reflex Klystron, Magnetron oscillator (cylindrical), Gunn Oscillator, Parametric amplifier, Introduction to Strip lines: Micro strip and Parallel Strip lines.

Unit IV: Microwave Devices

To study VI characteristics of Gunn diode, To determine the frequency and wavelength in a rectangular wave guide working on TE 10 mode, To determine the standing wave ratio and reflection coefficient, To study functioning and behavior of Isolator, E-Plane Tee, H-Plane Tee, Magic tee, Study of characteristics of Klystron tube and to determine its electronic tuning range.

Laboratory work:

Study of different Microwave guide components, determination the frequency and wavelength in a rectangular wave guide working on TE 10 mode, Finding the standing wave ratio and reflection coefficient. Measurement of an unknown impedance with smith chart, VI characteristics of Gunn diode, O/P power and frequency as a function of voltage in case of Gaunn diode, Magic tee, Characteristics of Klystron tube and determination of its electronic tuning range, various experiments using CST Tool.

Books Recommended:

1. Microwave Devices and circuits by Samuel Y. Liao
2. Microwave Principles By Herbert J. Reich
3. Foundations for Microwave engineering by Robert E. Collin
4. Elements of Engineering Electromagnetics by Nannapaneni NarayanaRao
5. Electromagnetic Field theory by Rishabh Anand

Course No. ELE-15205DCE/ELE-15213GE **VLSI Technology**
Paper type: DCE/GE **Credits: 2L+1T+0P**

Unit I: Crystal Growth, Epitaxy and Diffusion

Crystal Growth and Wafer Preparation, Electronic grade Germanium and Silicon, Zone melting process of purification, Simple purification process, Czhrolaski method. Epitaxy, Vapor phase epitaxy, Transport process and Reaction kinetics, Molecular beam Epitaxy process (introduction). Fick‟s one dimensional diffusion equation.Diffused layers, Pre deposition step, Drive-in diffusion with expression, Field aided diffusion, Diffusion system, C-V technique for profile measurement, Junction depth and sheet resistance measurement.

Unit II: Oxidation and Lithography

Oxidation Techniques, Growth mechanism and Kinetics of Oxidation layers, Oxidation techniques and Systems. Lithography, Lithography process and Types of Lithography, Optical Lithography, Contact proximity and projection Lithography techniques, Resists, Electron beam Lithography, Electron Resists.

Unit III: Etching, Metallization and IC Fabrication

Etching, Subtractive and Additive method of pattern transfer, Resolution and edge profiles in Subtractive pattern transfer, Selectivity and feature size control of an etching process. Contacts (Ohmic and rectifying), Physical vapor deposition, Methods of physical vapor deposition, Resistance heated evaporation, Electron beam evaporation, Thickness measurement and monitoring. Basic consideration for IC processing and Packaging, Modern IC fabrication.

Books Recommended

1. S. M. Sze, VLSI Technology, Mcgraw Hill Publishing Company.
2. Azeroff and Brophy, Electronic Processes in Semiconductors, McGraw Hill Publishing company.
3. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.
4. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.

Course No. ELE-15206DCE/ELE-15214GE **Optical Communication and Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Optical Fiber: Structures and propagation

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, different types of fibers, optical fiber modes and configurations, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED‟s and lasers, light sourse linearity, reliability consideration

Unit II: Digital and Analog links

Point to point links, power links, error control, coherent detection, differential quadrature phase shift keying (QPSK), overview of analog links, carrier- to- noise ratio, multichannel transmission techniques, RF over fiber, radio over fiber links

Unit III: WDM

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, SONET/ SDH, high speed lightwave links, optical Add/Drop multiplexing, optical switching, WDM examples.

Unit IV: Optical Networks

Passive Optical Networks, IP over DWDM, Optical Ethernet Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers. Optical system design Considerations, Component choice

Laboratory work:

To perform various experiments using OFC training kit, Multiplexing, Point-to- point links, System considerations, Overall fiber dispersion in Multi mode and Single mode fibers, Transmission distance, Line coding in Optical links, Measurement of Attenuation and Dispersion, Eye pattern.

Books Recommended:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Course No. ELE-15207DCE/ELE-15215GE — **CMOS VLSI and Nano-Electronics – II (Digital IC Design**

Paper type: DCE/GE — **Credits: 2L+0T+2P**

UNIT I: Introduction to CMOS and Combinational Logic Design

Digital IC, Digital Combinational and sequential circuit, issue in digital IC design, Quality, metrics of Digital Design, Review of CMOS.
Static C-MOS Inverter and its characteristics, CMOS Design consideration Transistor Sizing, Power Dissipation, Design Margining, Ratioed Logic, Pass Transistor Logic

UNIT II: Dynamic CMOS design and Sequential Logic Design

Dynamic CMOS design, basic principle, speeds and power Dissipation of Dynamic Logic, Signal Integrity in Dynamic Design, Cascaded Dynamic.
Static Latches and registrars, Dynamic Latches and Registers, Alternative Register Styles, Pipelining.

UNIT III: Memory Design and Implementation Strategies for Digital ICS

Memory Classification, Memory Architecture and Building Block, Read only Memories, Nonvolatile Read Write Memories, Read-Write Memories, Memory Peripheral Circuit
Custom, Semi-custom Circuit Design, Cell–Based Design Methodology, Array Based Implementation Approach**,** Layout

UNIT IV: Programmable Logic Devices

Introduction to PLA, PAL, PLD/CPLD, PGA/ FPGA, ASIC their applications and Architecture

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Digital design including combinational (Static and Dynamic) and sequential circuits, Memory and Programmable logic devices

Books Recommended:

1. J. M. Rabaey, A. Chandrakasan and B. Nikolic: Digital Integrated Circuits- A Design Perspective, 2nd ed., PHI, 2003
2. D. A. Pucknell and K. Eshraghian, Basic VLSI Design, PHI, 1995
3. N.H.E. Weste and K. Eshraghian, Principles of CMOS VLSI Design - a System Perspective, 2nd ed., Pearson Education Asia, 2002
4. S.M. Kang and Y. Leblevici, CMOS Digital Integrated Circuits Analysis and Design, 3rd ed., McGraw Hill, 2003
5. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia) Pte Ltd, 2002
6. R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 1997

Course No. ELE-15208DCE/ELE-15216GE — **Design and Analysis of Active Filters**
Paper type: DCE/GE — **Credits: 2L+0T+2P**

Unit I: Filter Approximation Models and Sensitivity Analysis

Introduction to Analog filter theory, filter approximations, Butterworth approximation, Chebyshev approximation, Bessel filters, frequency transformations, lowpass-lowpass, lowpass- highpass, lowpass-bandpass and low-pass - band reject transformations,

Unit II: Operational Transconductance Amplifier and Current Conveyors

Operational Transconductance Amplifier (OTA), Circuit Descriptions of OTA, Advantages, limitations. Elementary Transconductor Building Blocks: Resistor, Integrator, Amplifier, summers, gyrators and Modulators. First and Second order Filters, High-order filters. Current Conveyors (CCI and CCII)

Unit III: Sensitivity and Active filter Synthesis

Sensitivity study, Sensitivity function, magnitude and pass sensitivities, single parameter sensitivity, multiple parameter sensitivity. Cascade approach, Simulated Inductance Approach, Operational Simulation of LC ladders and FDNR approach. Immitance converters and inverters, Generalized Impedance converter.

Unit IV: Switched Capacitor filters

The MOS switch, The Switched capacitor/resistor equivalence, analysis of switched capacitor filter using charge conservation equations, First-order building blocks (Inverting and Non-inverting Amplifier, Integrator and Differentiator), Sampled-Data operation, Switched capacitor First and Second order Filters, Switched capacitor High-order filters.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on filter synthesis, operational transconductance amplifier and switched capacitor filters

Books Recommended:

1. Kendall Su, Analog Filters, Second Edition, Kluwer Academic Publishers, 2002
2. Larry D. Paarmann, Design and Analysis of Analog Filters: A Signal Processing Perspective, Kluwer Academic Publishers, 2003.
3. M. E. van Valkenburg and Rolf Schumann, Analog Filter Design, Oxford University Press, 2005.
4. Mingliang Liu, Demystifying Switched-Capacitor Circuits, Newnes, Elsevier, 2006.

Course No. ELE-15209DCE/ELE-15217GE **Simulation and Modeling using MATLAB**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to MATLAB

Introduction, MATLAB Windows, Types of Files, Constants, Variables and Expressions; Character Set, Data Types, Operators, Built-in Functions, Vectors and Matrices; Matrix Manipulations, Matrix and Array Operations, Control Structures; Loops and Branch Control Structures,

Unit II: MATLAB Editor and MATLAB Graphics

MATLAB Editor, Creating M-Files, Function Subprograms, Types of Functions, Function Handlers, Errors and Warnings, MATLAB Debugger, Two- Dimensional Plots, Multiple Plots, Subplots, Specialized Two-Dimensional Plots, Three-Dimensional Plots..

Unit III: Data and Image Visualization in MATLAB

Understanding Color maps, Using Color to Describe a Fourth Dimension, Image Data Matrices, Image Formats, Image Files, Image Utilities, Reading and Displaying Image, Image Compression, Image Denoising, Image Filtering, Introduction to Movies and Sound in MATLAB.

Unit IV: Simulink Basics

Starting Simulink, Simulink Modeling, Solvers, Data Import/Export, State-Space Modeling and Simulation, Simulation of Non-Linear Systems, Creating a random bit stream System objects and their benefits, Modulating a bit stream using Digital Modulation Techniques, Applying pulse-shaping to the transmitted signal, Modeling a QPSK receiver for a noiseless channel, Comuputing bit error rate

Laboratory Work:

A minimum of 20 programs to be simulated on MATLAB software across all the four units

Books Recommended:

1. P.A. Rajammal, *"A handbook of Methodology of Research",* Vidyalaya Press, 1976.
2. BuaneHanselman, Bruce Littlefield, *"Mastering MATLAB 7",* Pearson, 2013
3. Agam Kumar Tyagi, *"MATLAB and Simulink for engineers",* 2nd Edition, 2012.
4. Raj Kumar Bansal, *"MATLAB and its Applications in Engineering"*, Pearson, 2009.

Course No. ELE-15210DCE/ELE-15218GE **Data Structures**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Lists, Stacks and Queues

Lists, Abstract Data Type-List, Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked - Implementation and Applications. Stacks, Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Applications. Queues Abstract Data Type-Queue, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of DEQUEUE, Array Implementation of a dequeue, Linked List Implementation of a dequeuer.

Unit II: Trees

Trees, Abstract Data Type-Tree, Tree Traversals, Binary Trees, Binary Tree Traversals, Recursive Binary Tree Traversals, Non Recursive Binary Tree Traversals, Applications. Binary Search Trees, Traversing a Binary Search Trees, Insertion of a node into a Binary Search Tree, Deletion of a node from a Binary Search Tree, AVL Trees, Insertion of a node into an AVL Tree, Deletion of a node from and AVL Tree, AVL tree rotations, Applications of AVL Trees, B-Trees, Operations on B-Trees ,Applications of B-Trees.

Unit III: Graphs

Graphs Definitions, Shortest Path Algorithms, Dijkstra"s Algorithm, Graphs with Negative Edge costs, Acyclic Graphs, All Pairs Shortest Paths Algorithm, Minimum cost Spanning Trees, Kruskal"s Algorithm, Prims"s Algorithm, Applications, Breadth First Search, Depth First Search, Finding Strongly Connected Components.

Unit IV: Searching, Sorting and Advanced Data Structures

Linear Search, Binary Search, Applications. Internal Sorting, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sot, Heap Sort, Sorting on Several Keys. Splay Trees, Splaying steps, Splaying Algorithm, Red-Black trees, Properties of a Red Black tree, Insertion into a Red-Black tree, Deletion from a Red-Black tree, AA-Trees.

Laboratory Work:

Design, Implementation and Tests of Linked Lists, Stacks, Queues, Trees (Binary Tree, Recursive Implementation of Binary Tree Traversals, Non Recursive Implementations of Binary Tree Traversals, Applications.), Advanced Trees, Graphs, Searching, Sorting Techniques. C/C++ programming language shall be used in the laboratory for programming.

Books Recommended:

1. Tenenbaum, Data Structures through C
2. Weiss, Data Structures and Algorithms in C++
3. SamiranChattopadhy, Data Structures through C Language
4. Patel, Data Structures with C
5. Wiener and Pinson, Fundamentals of OOPS and Data Structures in Java

Course No. ELE-15211DCE/ELE-15219GE **Wireless Adhoc and Sensor Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards. Wireless LAN (Infrared Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11: System Architecture, Protocol Architecture, 802.11b, 802.11a)

Unit II: Ad Hoc Wireless Networks (MAC and Routing Protocols)

Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless Internet, MAC protocols, Issues in Designing a MAC Protocol for Ad hoc Wireless Networks, Design Goals for a MAC Protocol for Ad hoc Wireless Networks, Classifications of the MAC Protocols, Other MAC Protocols. Routing Protocols, Issues in Designing a Routing Protocol for Ad hoc Wireless Networks, Classifications of Routing Protocols.

Unit III: Ad Hoc Wireless Networks (Transport Protocols and Security)

Transport Layer for Ad Hoc Wireless Networks, Issues in Designing a Transport layer protocol for Ad hoc Wireless Networks, Design goals of a Transport layer protocol for Ad hoc Wireless Networks, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Other Transport layer protocols for Ad hoc Wireless Networks, Security protocols for Ad hoc Wireless Networks Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks

Unit IV: Sensor Networks

Basics of Wireless, Sensors and their Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs. Sensor Network Hardware: Components of Sensor Mote, Operating System in Sensors– TinyOS, LA-TinyOS, SOS, RETOS
Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor network extension, TOSSIM.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Adhoc Wireless Networks – Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education.
2. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press.
3. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group.
4. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers.
5. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group.

Course No. ELE-15220GE **Advanced Programming**
Paper type:GE **Credits: 2L+0T+2P**

Unit 1: Dot Net Architecture

DOT NET framework, MSIL, CLR, CLS, Name spaces, Assemblies Common Language Implementation Assemblies Metadata and Intermediate Language. Garbage Collection Versioning and Side-by-Side Execution. Integration Development Environment of VB, User Interface, Designing, Basics of Event driven programming. From- Designing, Showing & Hiding.

Unit II: Windows Programming Foundations

VB language- Data types, Variables & Constant, Arrays, Function, Collections, Procedures, Arguments passing, Control Flow statements: if- then, if-then-else, select case, looping statement: Do-loop, For-next, While-Wend, Nested Control Structure, Exit statement. Intrinsic and Active X Controls, Properties & Methods – Text box, List box, combo box, Scrollbar, slider Controls.

Unit III: Windows Programming with Active X Controls, Menus and Multiple Forms

Advance Active X Control – Common Dialog controls, Color, Font, File open, file save using Rich Textbox Controls. String Manipulations on Textboxes. Graphics controls – Picture Box, Coordinate system, Graphics Methods - Text drawing, Lines & Shape, Filling Shapes Grid methods. Menu editor: Pull-down, Pop-up Menus. Multiple Document Interface- Parent & Child Forms & Methods.

Unit IV: Advanced Windows Programming

OLE – Basics, OLE control Properties & Methods, Error handling in VB- Types of Errors, Error handling methods and functions. Database Programming with VB database Models, Visual Data manager, DATA Control- Methods, Properties, Connectivity with database, DATA bound controls, ADO Database Controls, Creating & using Database with object model, Attaching Queries with database. Filtering Data. DATA Report Designer.

Laboratory Work:

Programming exercises using VB.NET for problem solving involving use of arrays, collections, procedures, control flow, intrinsic and active-x controls, files, SDI and MDI interfaces and databases.

Books Recommended:

1 .Mastering VB .NET by EvangelosPeteroutsos, WROX Publications
2. Dietel and Dietel, "Visual Basic, How To Program", Pearson Education.
3. Peter Norton"s Guide To Visual Basic 6 By Peter Norton
4. Beginning Visual Basic 6 By Peter Wright, Shroff Publishers
5. Programming In Visual Basic 6.0 By Mohammed Azam, Vikas Publishing House

Course No. ELE-15212DCE/ELE-15221GE **Communication Hardware Design**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Design of High Frequency Amplifier and Oscillators

Review of Noise in Electronic Networks; Network Noise Representation, Broad Banding Techniques - Input Compensation, Feedback, Lossless Feed-back Amplifiers, Neutralization, Cascode Amplifiers; Theory of Automatic Gain Control; AGC System Components; Design Examples; High Frequency Oscillator Circuits; Amplitude and Phase Stability; Parallel Mode and Series Mode Crystal Oscillators; Voltage Control Oscillators; Design Examples

Unit II: Phase Locked Loop (PLL) and Their Applications

Introduction; Linear Model of the Phase Locked Loop, Phase Detectors, VCOs and Loop Filters Design Examples and Applications; Tracking Filters; Angle Modulation: Frequency Demodulation, Amplitude Demodulation; Phase Shifters; Signal Synchronizers; Costas Loop; Digital Phase Lock Loop

Unit III: Frequency Synthesizers

Introduction; Direct Frequency Synthesis; Frequency Synthesis by Phase Lock; Effect of Reference Frequency on Loop Performance; Variable Modules Dividers; Methods for Reducing Switching Time; Direct Digital Synthesis; Synthesizer Design Examples; Output Noise Considerations

Unit IV: Mixers, High Efficiency Amplifiers

Frequency Mixers; Switching Type; Mixers and Their Performance; Square Law Mixers; BJT and FET Mixers; Balanced Modulator ICs, Class C Power Amplifier Design; Frequency Multiplication; Class D, E and S Amplifiers; Modulators and Amplifiers Using Vacuum Tubes and Power Electronic Devices.

Laboratory Work:

The students are required to conduct at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. J. Smith, Modern Communication Circuits, McGraw Hill Book, 1996.
2. D. Roddy& J. Coolan, Electronic Communication, Prentice Hall of India, New Delhi, 1987.
3. Sidney Soclof, Applications of Analog ICs, Prentice Hall of India, New Delhi, 1990.

Course No.: ELE-15222OE **Computing and Informatics –II**
Paper Type: OE **Credits: 1L+0T+2P**

Introduction to algorithms and flow charts, Introduction to programming, types and categories of programming languages.Introduction to C programming language, declarations, expressions, control statements, arrays, functions, and pointers.Introduction to database management system, basic networking concepts, electronic mail and WWW, introduction to information security.

Lab Work:

Writing C programs using basic programming elements including control statements, arrays, function and pointers. Familiarity with e-mail and information security.

Recommended Books:

1. YashwantKanitker "Let Us C" 13th Edition BPB Publication.
2. Michael E. Whitman"Principles of Information Security" 4th Edition, Cengage Learning India.
3. S. K. Srivastava "C in Depth" BPB Publications.
   Philipa,Wingate "Internet for Beginners" E.D.C Publishing

Course No.: ELE-15223OE **Basic Electronic Devices and Circuits**
Paper Type: OE **Credits: 1L+0T+2P**

Review of Active and Passive components; Signals and Waveform Spectra.
Bipolar Junction Transistor (BJT), Types of transistors, Symbol, Biasing of transistor, transistor Configurations. ALPHA & BETA of a transistor. Amplification, Transistor as an amplifier. Classification of Amplifiers, Class A, B.C. Power amplifier, Impedance matching, Introduction to JFET and MOSFET, Typical Public Address system..

Oscillators, importance, applications to electrical circuits. Factors controlling oscillation. Types of Oscillators, A.F and R.F Oscillators, Crystal Oscillator, Oscillators used in Radio circuits,

Power supply. AC/DC Voltage/Current, Unregulated and regulated power supplies, introduction to IC based regulated power supplies. Study of 78XX and 79 XX series. SMPS Power Supply, DC/AC Inverters, working principle. UPS.

Lab Work:

Testing a Transistor, Terminal determination, Calculation of Alpha and Beta. Transistor configurations, Transistor as an amplifier. Regulated Power Supply, Study of 78XX and 79XX series. Study of various Oscillators.

Books Recommended:

1. Boylested, Electronic Devices and Circuit Theory.
2. Sidra and Smith, Microelectronic Circuits.
3. M. H. Rashid, Power Electronics circuits and devices, PHI

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER III

Course No. ELE-15301C **Physics of Semiconductor Devices**
Paper type: Core **Credits: 2L+1T+0P**

Unit I: Crystal Structure and Carrier Transport

Crystal Structure, Space lattices, Primitive and Unit Cell, Index system for crystal planes, Separation between the parallel planes of a cubic crystal, Description of Schrodinger wave equation and its application to free space and Potential well, Physical interpretation of wave function, Kroning Penney Model, K-space diagramEffective mass, Concept of Hole, Derivation of Density of state functions, Fermi-Dirac Distribution function, Carrier concentration at thermal equilibrium, Carrier transport Equation, Decay of photo excited carriers, carrier lifetime, Hall effect.

Unit II: Semiconductor and BJT's

Abrupt and Graded PN junction, Current- voltage characteristics of PN junction, Depletion Capacitance, Diffusion capacitance, Junction breakdown phenomenon, Schottky effect, Bipolar junction transistors, current gain parameters, minority carrier distribution and terminal currents, Eber-Moll model.

Unit III: Field Effect Transistors, Microwave and Opto Electronic Devices

Field effect transistors, JFET and MOSFET- Basic device characteristics with analysis, MOS Capacitors, MOSFET Types- Basic device Characteristics with analysis, Equivalent Circuit. IMPATT: Static and Dynamic Characteristics, Gun diode and its Modes of operation, P -N Junction Solar Cells, V-I Characteristics, Ideal Conversion efficiency.

Books Recommended:

1. Donald E. Neaman, Semiconductor Physics and Devices, Basic Principles, McGrawHill Publishing, 3rd Edition, 2003.
2. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.
3. S. M. Sze, Physics of Semiconductor Devices, Wiley eastern Ltd.
4. AzeroffandBrophy, Electronic Processes in Semiconductors, McGraw Hill Publishing Company.
5. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.

Course No. ELE-15302C **Control Systems Engineering**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Control Systems and System Representation

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods, Control of Physical Systems: Speed and temperature.

Unit II: Time Domain Analysis of Control Systems

Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit III: Stability and Frequency Analysis

Stability : Conditional an absolute stable systems, location of poles and stability, Routh- Herwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit IV: Introduction to Modern Control Theory

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, state diagrams, Block diagram representation of state equations, state space representation from ordinary differential equations, concepts of controllability and observability.

Laboratory Work:

Time domain analysis of 1st and 2nd order system (Impulse and Step Response), Design of PI, PD and PID controllers, Root Locus Plot, Polar Plot, Study of Gain Margin and Phase Margin using MATLAB.

Recommended Books:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw HillInternational
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

Course No. ELE-15303C **Digital Signal Processing**
Paper type: Core **Credits: 2L+0T+2P**

Unit-I: Discrete Time Signals and Systems

Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIR systems, IIR systems, Recursive Systems, Non- recursive Systems, Correlation: Cross- Correlation and Auto- Correlation, Properties, A/D Conversion Process: Sampling, Frequency Relationships, Aliasing, Quantization, Encoding, Anti-Aliasing Filter. Fourier Series and Fourier Transform, Sampled data and discrete time convolution, Z transform and its Properties.

Unit –II: Discrete Fourier Transform (DFT)

Introduction, Frequency Domain Sampling, Properties of DFT, Linear Filtering Techniques based on DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT algorithms, Properties of WN, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

Unit -III: Infinite Impulse Response (IIR) Filters

Frequency response for rational system functions, All pass minimum phase functions; Basic structures for IIR systems: Design of IIR from continuous time filters, Frequency transformation of IIR low pass filters

Unit -IV: Finite Impulse Response (FIR) Filters

Linear systems with generalized linear phase; Basic network structures for FIR filters; Design of FIR filters; window functions.Frequency sampling technique. Comparison of FIR and IIR filters. Introduction to finite word length effects in DSP.

Laboratory Work:

Introduction to digital signal processing toolbox (MATLAB). Commonly used DSP based commands in MATLAB, Computation of Correlation and convolution of various sequences using MATLAB. DFT computation, Optimal order FIR filter design in MATLAB. Performance analysis of various windowing techniques for a given set of specifications using MATLAB

Books Recommended:

1. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
2. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
3. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

Course No. ELE-15304C **Computer Networks**
Paper type: Core **Credits: 2L+0T+2P**

Unit 1: Introduction

Introduction to computer networks, history and development of computer networks, network topologies, network architecture, network protocols and standards, network models, layered architecture, OSI model, TCP/IP model, other network models, Design issues in protocols at different layers.

Unit II: Network Interface Layer

Physical Layer: Transmission medium: guided and unguided media, errors in transmission: attenuation, noise. Repeaters. Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.). MAC Layer: Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Wired LANs: Ethernet, IEEE Standards, Fast Ethernet, Gigabit Ethernet, wireless LANs: and WiFi (IEEE 802.11), Token Ring and Bluetooth, WiMax. Connecting LANS: Connecting devices, Backbone networks, Virtual LANS. Virtual circuit networks: Architecture and Layers of Frame Relay and ATM. Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols. LAN: Design, specifications of popular technologies, switching (circuit and packet switching).

Unit III: Network Layer

Internet Protocols (IPv4 & IPv6), ARP, DHCP, ICMP, IGMP, Routing algorithms :(unicast, multicast) Distance vector, Link state, Metrics, addressing techniques: address Classless (class A, class B, class C), CIDR, Sub netting, Network Address Translation.

Unit IV: Transport and Application Layer

Transport layer: Process to process delivery, user datagram protocol (UDP), transmission control protocol (TCP). Connection establishment and termination, flow and congestion control, timers, retransmission, TCP extensions, etc. Quality of services, techniques to improve QoS. Application Layer (Presentation Layer and Session Layer). Protocols at application layer: FTP, TFTP, DNS, SMTP, email, IMAP, POP, HTTP, WWW, browsers, static, dynamic and active webpages etc. Introduction to Network Security.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2006:
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003:
3. Andrew S Tanenbaum, DJ Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.
4. LL Peterson, BS Davie, Computer Networks: A Systems Approach, 5th Ed., Morgan-Kauffman, 2011.
5. W Stallings, Cryptography and Network Security, Principles and Practice, 5th Ed., Prentice-Hall, 2010

Course No. ELE-15305DCE/ELE-15316GE — **Microcontrollers, Architecture, Interfacing and Programming**

Paper type: DCE/GE — **Credits: 2L+0T+2P**

Unit 1: Architecture

Microcontroller versus General-purpose Microprocessors, Microcontrollers for embedded systems, Embedded applications, choosing a Microcontroller. Architecture of Atmel AT89C51Microcontroller, input/output pins, ports and circuits, external memory, counter and timer, serial data input and output, interrupt, Other members of 8051 family of microcontrollers.

Unit II: Instruction Set and Programming

Addressing modes: immediate and register addressing modes, accessing memory using various addressing modes. Arithmetic instructions and programs: unsigned addition and subtraction, unsigned multiplication and division, signed members concepts and arithmetic operations. Logic Instruction and programs: Logic and compare instructions rotate and swap instructions. Jump, Loop and call instructions; Loop and jump instructions, call instructions, time delay, generation and calculation. Single bit instructions and programming: single bit instruction programming, single bit operation with carry reading input pins versus port latch. I/O port programming: I/O programming, bit manipulation.

Unit III: Timer / Counter, Serial Communication and Interrupts Programming

Timer / Counter programming: programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication programming: Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051; programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.

Unit IV: Interfacing and PIC Microcontrollers

Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing stepper motor.Introduction to PIC series of Microcontrollers. Architecture and programming of 8-bit and 16-bit PIC microcontrollers.

Laboratory Work:

The Laboratory work shall include 10 Practicals based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
2. Kenneth J. Ayala., “The 8051 Microcontroller Architecture Programming and Applications”, Penram International Publishing (India). 1996.
3. MykePredko, Programming and Customizing the PIC Microcontroller
4. Fernando E. Valdes-Perez, Ramon Pallas-Areny, Microcontrollers: Fundamentals and Applications with PI

Course No. ELE-15306DCE/ELE-15317GE **Advanced Communication Systems**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit-I Modern Radar System

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, prf, Un-ambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter. Tracking Radar Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Mono pulse Radar.

Unit-II Telecommunication Switching Techniques

Time division switching: Time switching, space switching, Three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling

Unit-III Satellite Communication

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N).

Unit-IV Multiple Access Techniques

Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT.

Laboratory Work:

To develop a simple switching model using Matlab, to study various multiplexing techniques used telecommunication networking, to study stored program based space division switch, to under fading in satellite communication using wireless communication link, to verify radar equation in Matlab

Books Recommended:

1. J.G. Proakis, “Digital Communication”, MGH 4TH edition.
2. Edward. A. Lee and David. G. Messerschmitt, “Digital Communication”, AlliedPublishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, “DigitalCommunication Techniques”, PHI.

Course No. ELE-15307DCE/ELE-15318GE **Digital System Design using HDL**
Paper type: DCE **Credits: 2L+0T+2P**

UNIT I: Hardware Description Languages and VHDL

Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioral, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes:
Assignment, Logical, Arithmetic, Relational and concatenation operators

UNIT II: Concurrent, Sequential Codes and State Machines

Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, PROCESS, IF, ELSIF, WAIT, CASE, LOOP, Signal versus Variable, Bad Clocking, Brief concepts of Finite State Machines,(Melay and Moore Machines), state diagrams and state tables.

UNIT III: Combinational and Sequential Circuit Design.

Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, Boolean functions using Multiplexer. Shanons expansion theorm, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UPDOWN,
Johnson and Ring Counters.

UNIT IV: System Design and Programmable Logic Devices.

Introduction to COMPONENTS and FUNCTIONS, Port Mapping, Digital system design: VHDL modeling of ALU, Pseudo random Number Generator, Sequence detector, Traffic Light Controller, Barrel shifter, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices (CPLD) and Field Programmable Logic Arrays(FPGA), Advantages of FPGAs, Application Specific integrated Circuits (ASIC), FPGA design flow.

Laboratory Work:

Familiarity with Quartus Altera/ Xilinx ISE Suite. Combinational systems Implementation: Adder, Subtractor MUX, DEMUX, Encoder, Decoder and Comparator etc. Sequential system Implementation: Flip Flop, Shiftregisters, ALU, LFSR.

Books Recommended:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
4. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design,TMH.2008.

Course No. ELE-15308DCE/ELE-15319GE **Speech and Audio Processing**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT-I: Fundamentals of Speech

The human speech production mechanism, LTI model for speech production, nature of the speech signal, linear time varying model, types of speech, voiced and unvoiced decision making, audio file formats: nature of WAV file, parameters of speech, spectral parameters of speech

UNIT-II: Linear prediction of speech and Quantization

Lattice structure realization, forward linear prediction, auto correlation covariance method, uniform and non-uniform quantization of speech, waveform coding of speech,the .726 standarad for ADPCM, parametric speech coding technique, RELP based vocoder, Transform domain coding of speech, sub-band coding of speech

UNIT-III: Speech Synthesis

History of text- to- speech system, synthesizer technologies, HMM based speech synthesis, sine wave synthesis, speech transformation, emotion recognition from speech, watermarking for authentication of a speech/ Music signal, digital watermarking, watermarking in capestral domain.

UNIT- IV Speech Processing Applications

Speech Recognition systems, Architecture of a Large Vocabulary Continuous Speech Recognition System, Deterministic Sequence Recognition for ASR, Statistical Sequence Recognition for ASR, VQ-HMM based speech recognition. Speech Enhancement, Adaptive Echo Cancellation.

Laboratory Work:

To simulate speech processing model using Matlab, Speech recognition systems implementation Acoustic analysis, linear time warping, dynamic time warping (DTW), Statistical Sequence Recognition for ASR: Bayes rule, Hidden Morkov Model (HMM), VQ- HMM based speech recognition. Speech watermarking using Discrete cosine Transform (DCT), Discrete Wavelet Transform

Books Recommended:

1. Speech and Audio Processing, Dr. Shaila D. Apte, Wiley Publications
2. Digital Signal Processing, Dr. Shaila D. Apte, Wiley Publications
3. Theory and Applications of Signal Processing, L. R. Rabiner and B. Gold, Prentice Hall 1985
4. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
5. Introduction to Digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall

Course No. ELE-15309DCE/ELE-15320GE **CMOS VLSI and Nano-Electronics–III (Analog and Mixed IC Design)**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Analog CMOS Sub-circuits

MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources, Translinear Circuits: Ideal Translinear Element, Translinear-loop-circuit synthesis, Various Translinear circuits, Squarer/divider, Squarer rooting, Current Mirrors, The Basic Current Mirror, Cascoding the Current Mirror, Biasing Circuits

Unit II: Amplifiers

Amplifiers, Gate-Drain Connected Loads, Current Source Loads, Common-Source Amplifier, TheCascode Amplifier, The Common-Gate Amplifier, The Source Follower (Common-Drain Amplifier), The Push-Pull Amplifier, Differential Amplifiers, The Source-Coupled Pair, The Source Cross-Coupled Pair, Cascode Loads
The Gilbert Cell

Unit III: References, Multistage Amplifiers and Nonlinear Circuits

Voltage and Current References, MOSFET-Resistor Voltage References, Parasitic Diode-Based References, Bandgap Reference Design, Operational Amplifiers, The Two-Stage Op-Amp, The Operational Transconductance Amplifier (OTA), Basic CMOS Comparator Design, MOS Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, Modulation and Demodulation using Analog Multipliers

Unit IV: Data Converters

Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Analog CMOS subcircuits, amplifiers, References and Data converters

Books Recommended:

1. P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, Analysis and Design of analog integrated circuits, John Wiley and Sons, 2001.
2. R. Jacob Baker, CMOS, Circuit Design, Layout, and Simulation, JOHN WILEY & SONS, 2010.
3. P. E. Allen and D. R. Holberg, CMOS analog circuit design, Oxford University Press, 2002.
4. Shih-Chii Liu et al, Analog VLSI: Circuits and Principles, The MIT Press, 2002.

Course No. ELE-15310DCE/ELE-15321GE **RF Engineering**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: RF Passive Components and Transmission Line Analysis

High frequency Resistors, Capacitors and Inductors – Transmission Line Analysis line equation –Micro stripe line – SWR voltage reflection co-efficient propagation constant, phase constant, phase velocity – smith chart – parallel RL and RC circuits ABCD parameters and S parameters.

Unit II: RF Circuits Design
RF Oscillator Design, Fixed frequency oscillator – Dielectric resonant oscillator, Voltage controlled oscillator- sun element oscillator – RF mixer design – single ended mixer – double ended mixer – RF filter resonator and filter configuration – Butterworth and chebyshev filters – Design of micro stripe filters.

Unit III Communication Circuits

Integrated Circuit Requirements for Modern RF/Wireless System; RF Circuits – Low-Noise Amplifier (LNA) and Power Amplifier (PA); Oscillators; Mixers; Modulators and Demodulators; Integration Issues of RF and Baseband Circuits

Unit IV: RF System Design

Link design – Fading design – Protected and non protected microwave systems – Path calculation Spread spectrum microwave system – Compatibility – Safety co-ordinate systems – Datam‟s& GPS Receiver design receiver architecture dynamic range – frequency conversion and filtering examples of practical receivers FM broadcast, Digital cellular, Multimeter wave point to point,Direct conversion GSM receiver-RF MEMS: Concept, Implementation and Applications

Laboratory Work:

Hands on training using Network optimization and planning tool. Field visit at any Cell site, Study of various physical and logical channels in GSM system. Study of tilting of antenna system in GSM

Books Recommended:

1. Reinhold Ludwig and PavelBretchko, "RF circuit design," Pearson Education, 2007.
2. David Pozar, "Microwave and RF design of Wireless systems," Johnwiley, 2008.
3. Josn Rogers and Calvin Plett, "Radio frequency Integrated circuit design," Artech house, 2002.
4. FerriLosee, "RF systems, Components and Circuits handbook," Artech house, 2002.
5. Joseph.J.Carr, "Secrets of RF circuit design," Tata McGraw Hill, 2004.
6. VivekVaradhan," RF MEMS and their applications", Wiley Eastern edition, 2003.

Course No. ELE-15311DCE/ELE-15322GE **Microwave Integrated Circuits (MICs)**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: MICROSTRIP LINES DESIGN ANALYSIS

Introducion, Types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation, Numerical method, Hybrid mode analysis, Losses in microstrip, Introduction to slot line and coplanar waveguide.Expermiments using MMIC CAD tools and simulation techniques.

Unit II: COUPLED MICROSTRIP, DIRECTIONAL COUPLERS AND LUMPED ELEMENTS
Introduction to coupled microstrip, Even and odd mode analysis, Branch line couplers, Design and fabrication of lumped elements for MICs, Comparison with distributed circuits.Experiments using MMIC CAD tools and simulation techniques.

Unit III:NON-RECIPROCAL COMPONENTS AND ACTIVE DEVICES

Ferromagnetic substrates and inserts, Microstrip circulators, Phase shifters, Microwave transistors, Parametric diodes and amplifiers, PIN diodes, Transferred electron devices, Avalanche, IMPATT,BARITT diodes. Experiments using MMIC CAD tools and simulation techniques.

Unit IV:MICROSTRIP CIRCUIT DESIGN AND APPLICATIONS
Introduction, Impedance transformers, Filters, High power circuits, Low power circuits, MICs inSatellite and Radar, Fabrication process of MMIC, Thick film and thin film technology and materials. Experiments using.

Laboratory Work:

Laboratory work shall consist of at least ten practical across all four units using MMIC CAD tools.

Books Recommended:

1. Monolithic Microwave Integrated Circuits: Technology & Design (Artech House Microwave Library) Hardcover – January 1, 1989, Ravender Goya.

2. Advances in Monolithic Microwave Integrated Circuits for Wireless Systems: Modeling and Design Technologies, ArjunaMarzuki , Ahmad Ismat Abdul Rahim , MouradLoulou

Course No. ELE-15312DCE/ELE-15323GE **Soft Computing and Neural Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle for Fuzzy Sets, Concept and models of Fuzzy logic Circuits-viz. AND, OR and NOT.

Unit II: Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, Probability vs. possibilities, Approximate reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition of compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rule based models.

Unit III: Introduction to Neural Networks

Biological and Artificial Neurones, Neuron Models: Classification and Linear Separability, X-OR Problem, Hopfield Networks, Overview of Neural Networks Architectures: Mulyilayered Feed forward and Recurrent Networks, Learning: Supervised, Unsupervised and Reinforcement, Learning Laws. Back-propagation (BP) Networks, Generalized delta rule, BP Training Algorithm and Derivation for Adaptation of Weights,

Unit IV: Programming

Implement fuzzy set operation and properties; verify various laws associated with fuzzy set; Demonstration of Mamdani and TSK rule based system using fuzzy logic tool box; Implement basic logic functions using Adaline and Madaline with bipolar inputs and outputs; implement composition of fuzzy and crisp relations; Implement discrete Hopfield network and test for input pattern; implement back propagation network for a given input pattern;

Laboratory Work :

Laboratory work shall consist of at least 15 practical across all four units using MATLAB tool.

Books Recommended:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klirabd B. Yuan, Printice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, Printice Hall of India
3. Neura;l Networks in Computer Intellligence, Limin Fu, Mcgraw Hill International
4. Adaptive Recognition and Neural Networks, Yoh-Han Pao, Addison Weseley
5. Introduction to the Theory of Neural Computations, John Hertz, Anders Krogh and Richard G. Palmer, Addison Wesley.

Course No. ELE-15313DCE/ELE-15324GE **Coding Theory**
Paper type: DCE **Credits: 2L+0T+2P**

UNIT I: Modern Algebra for Coding

Introduction to Algebra: Groups, identity element, inverse of an element, finite group, fields, modulo addition and multiplication, characteristic of field, Galois field, polynomial over GF(2), irreducible and primitive polynomials, construction of GF(2^m), power, polynomial and m-tuples representations, Vector spaces, properties, subspace, linear combination, linear interdependence, spanning of a vector space, basis and dimension of a vector space, dual space, row space, orthogonality.

UNIT II: Linear Block Coding

Linear Block Codes: Definition, message and code words, Generator matrix, systematic code word, parity-check matrix, encoding circuit, syndrome, error detection, syndrome circuit, minimum distance and minimum weight, error-detecting and error-correcting capabilities, standard array and syndrome decoding, decoding circuit

UNIT III: Convolutional Coding

Convolutional codes: Encoder, constraint length, code tree, code trellis, state diagram, fractional rate loss, generator polynomials, structural properties, branch and path gains, generating function, Viterbi algorithm

Unit IV: Spreading Sequences

Spreading Codes in CDMA: Linear Feedback Shift Register (LFSR), LFSR Generator Implementations-Fibonacci and Galois implementation, Maximal length sequences-generation, properties, Generation of Gold codes, Kasami sequences, Walsh codes. Turbo Codes: Generation and properties.

Laboratory Work:

MATLAB implementation of Block codes, Convolution codes and Spreading Codes (At least 10 practicals).

Books Recommended:

1. Introduction to Coding Theoryby Ron Roth, March 20, 2006, SBN-13: 978-0521845045 ISBN-10: 0521845041
2. Essential Coding Theory,by VenkatesanGuruswami, AtriRudra, Madhu Sudan - University at Buffalo ,2014.

Course No. ELE-15314DCE/ELE-15325GE **Cryptography and Information Security**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Conventional Encryption Techniques

Introduction to security attacks, services and mechanism, Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified Des, Block Cipher Principles, Data Encryption Standards, Differential And Linear Cryptography Principles, Block Cipher Design Principles, Modes of Operations, Algorithms Like Triple Des, International
Data Encryption Algorithm, Blowfish, Rc5, Cast-128, Rc2, Characteristics of Advanced Symmetrical Block Cipher, Issues Of Conventional Encryption Like Traffic Distribution, Random Number Generation, Key Distribution.

Unit II: Public Key Cryptography

Principles of Public-Key Cryptography, RSA Algorithm, Key Management, Elliptic Curve Cryptography, Diffie-Hellman Key Exchange. Number Theory: Prime And Relative Prime Numbers, Modular Arithmetic, Euler‟s Theorem, Euclid‟s Algorithm, Discrete Logarithm Tics

Unit III: Message Authentication and Hash Functions

Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security of Hash Functions and Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Ripemd-160, HMAC

Unit IV: Network Security

Identifying Risks to Network Security, Open and Closed Security Models, Trends Driving Network Security, Information Security Organizations, Digital Signatures, Implementing Authentication, Data Integrity, and Non repudiation, Authentication Protocols, Digital Signature Standards, Application Authentication Techniques Like Kerberos, X.509 Directory Authentication Services, SNMP, Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots, etc.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations (at least 10 Practicals to be conducted).

Books Recommended:

1. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
2. Cryptography and Network Security (2nd Ed.), AtulKahate, TMH
3. Information Systems Security, Godbole, Wiley-India
4. Information Security Principles and Practice, Deven Shah, Wiley-India
5. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, 2nd Edition, Cengage Learning Pub.

Course No. ELE-15315DCE/ELE-15326GE **Advanced Microprocessors**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Intel 8086, 80186 and 80286 Processors

Architecture and working of 8086 and 80186 Microprocessor, Register set of 8086 and 80186 Microprocessor, Addressing Modes and memory segmentation in 8086 and 80186 microprocessor, Differences between 8086 and 80186 microprocessors. Intel 80286 Microprocessor, 80286 Architecture, system connection – Real and Protected mode operations.

Unit II: Intel 80386 Processor: Architecture and Programming

Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection – call gates – I/O privilege levels – Interrupts and exception handling – task switching – paging mode – 80386 virtual 86 mode operation.

Unit III: Intel 80486 and Pentium Processors: Architecture and Programming

80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode, Recent trends in microprocessor design. Pentium – super scalar architecture – u-v pipe line – branch prediction logic – cache structure – BIST (built in self-test) – Introduction to MMX technology.

Unit IV: Advanced and Special Purpose Processors

Architecture, addressing and programming of Digital Signal Processors, co-processors and I/O processors. Difference between CISC and RISC processors, various emerging trends in Microprocessor Design. Introduction to graphics and other special purpose processors, Introduction to architecture of multi-core processors.

Laboratory Work:

The Laboratory work shall be based on units I through IV. The laboratory work shall include al least 10 practicals on the study of instruction sets of Intel Processors, Programming exercises for 16, 32 and 64 bit data processing, Use of Macros and Procedures, IVT and ISR, DSP programming for Image Processing such as Image Compression, Image Restoration, Image Enhancement, etc.

Books Recommended:

1. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company
2. Advanced Microprocessors by Daniel Tabak McGraw-Hill.
3. Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.
4. Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education
5. Advanced Microprocessors by Y. Rajasree, New Age International.

Course No. ELE-15327OE **Electronic Equipment Maintenance**
Paper type: OE **Credits: 1L+0T+2P**

Pre-requisite for the course: Evidence of the student having passed a basic course in Electronics

Transformers, UPS and Batteries
Transformers: Single-Phase Transformers, Transformer ratio, Transformer winding, auto cuts and line protection. Fabrication and repairs of Transformers. UPS: Principle and operation, performance parameters, capacity, Repairs of UPS. Rechargeable Batteries: Principle, types, capacity, AH rating. Fabrication and repairs of batteries.

Assembling and maintenance of Computers
Assembling of a computer system, Hardware maintenance of a computer system, memory upgradation, software faults.

Mobile Phone, Maintenance and Repair
Mobile phones: Introduction, IC Replacement and Reballing, methods of Flashing, Mobile Unlocking, Mobile Formatting, UI Settings. Mobile Downloading, Blue-Tooth & Card-Reader Cables.

Lab Work:

The teacher shall provide practical demos and training to the students on all the theory topics.

Books Recommended:

1. "Engineering Fundamental and Problem Solving" by Eide, et. al., 2002, John Wiley & Sons.
2. Manuals for Transformer and motor winding
3. Manuals for UPS, Mobile Phones, Bio-medical equipment.
4. Computer Assembling and maintenance manuals.

Course No. ELE-15328OE **Basic Radio and TV Engineering**
Paper type: OE **Credits: 1L+0T+2P**

Concept of Voltage and Current, AC/DC Voltage/Current, Current sources.
AC signals and waveforms, amplitude, frequency, wavelength, electromagnetic signals, Bandwidth, speed; classification of em-spectrum, concept of radiation and antenna, relation between antenna height and wavelength.
Review of Active and Passive elements: Resistors, Capacitors, Inductors, Semiconductors, symbols, Intrinsic/Extrinsic and P/N type semiconductors, Diodes, symbol, Example of Diodes, Characteristics of Diode. Simple examples/circuits.
Filter circuit, Types of Filter circuits, High pass, Low pass, Band pass filters.
Bi-polar Junction Transistor (BJT), symbol, BJT action, Types, BJT Biasing, BJT amplifier circuit. Introduction to Op-Amp.
Sound/Audio signals, Bandwidth, conversion of sound into electrical signal, microphones, types, Loudspeakers.
Concept of Oscillators, simple oscillator circuit and applications, crystal oscillator.
Need for modulation, definition of modulation, types of modulation, A.M., F.M., Broadcasting, Bandwidth, Demodulation.
Radio Broadcasting, Radio Receiver circuit, super heterodyne receiver, IF, RF and amplifier stages, concept of tuning, Service manual of radio receiver.
Concept TV broadcasting, converting an optical image into electric signal, Video signal, concept of scanning, flicker, basic video camera, TV Transmitter, Basic TV Receiver, Block Diagram, CRT.
Concept of Luminance and Chrominance, Color signal, Color video camera, Color TV broadcasting, Introduction to NTSC and PAL systems, Block diagram of Colr TV receiver, LCD and LED TV receivers.
Service manual of Color TV receivers, fault finding.

Books:

1. Basic Electronics by Malvino.
2. Basic Radio and TV Engineering. By R R Gulati
3. Digital and Analog Communication by Tomasi.

DETAILED SYLLABUS

FOR

M. Sc Electronics
SEMESTER IV

Course No. ELE-15401C — **Digital Communications and Information Theory**
Paper type: Core — **Credits: 2L+0T+2P**

UNIT I: Information Theory
Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a Discreate Memoryless Channel ,Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy,Mutual Information, Discrete Communication Channels, Channel representation and Channel Matrix, Mutual information for each channel, Channel Capacity, Shannon‟s Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon- Fano Coding, Huffman Coding.

UNIT II: Pulse Code Modulation
Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

UNIT III: Band Pass Digital Carrier Modulation and Channel Coding
Digital modulation techniques: Generation and Detection of Amplitude Shift Keying (ASK), frequency Shift keying (FSK), Phase Shift Keying, and Differential Phase Shift Keying (PSK and DPSK), base band receiver Optimum Filter, Correlator, Probability of Error in each Scheme,. Error Control Coding: Linear Block codes, (7, 4) Linear Block Coding, matrix representation of linear block codes, Cyclic Codes, polynomial representation (examples).

UNIT IV: Wide Band Digital Communications
Basics of Wide band Systems, Generation of Spreading Codes (PN Codes, Gold Codes), Properties of PN codes, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation and Detection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Introduction to Digital Cellular Communication Systems: Architecture of GSM.

Laboratory Work:

The laboratory work shall consist of at least 10 practicals based on unit I through unit IV and shall use hardware implementation as well as experiments using MATLAB/Simulink.

Books Recommended:

1. Digital Communication By Simon Hykin.
2. Digital and Analog Communication by K. Shan Mugam.
3. Digital and Analog Communication by Tomasi.
4. Digital Communications By Bernard Sklar, Pearsons Education.
5. Digital Communications By John G. Proakis McGraw- Hill International Editions.
6. Information Theory Coding and Cryptography by Ranjan Bose, TMH.

Course No. ELE-15402C **Electronic Instrumentation**

Paper type: Core **Credits: 2L+0T+2P**

Unit I: Measurements and Instrumentation

Fundamentals of Measurements Errors in measurement; Controlling and Networking of Instruments; Signals and Signal Conditioning; Noise and Interference

Transducers: Classification of transducers, characteristics and choice of transducers; Resistance, Capacitance, Peizoelectric, Thermoelectric, Hall effect, Photoelectric, Techogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed, and sound, temperature, pressure, flow, humidity, thickness, pH, position.

Unit II: Digital Measurements

Counters, Digital frequency meters and time meters, Universal counter timer. Digital Voltmeter: General Characteristics, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Integrating type DVM Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter, Digital tan delta meter, Digital IC tester.

Unit III: Oscilloscopes and Analyzers

Multi Trace Oscilloscope, Dual trace Oscilloscope, Dual beam Oscilloscope, Sampling Oscilloscope, Storage Oscilloscope, Analog storage Oscilloscope, Digital storage Oscilloscope, Comparison between Analog and Digital storage Oscilloscope

Harmonic distortion analyzer, Wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Application of Wave analyzer, Spectrum Analyzer, Spectrum Analyzer characteristics, Real time spectrum analyzer, Swept tuned spectrum Analyzer, Logic Analyzer

Unit IV: Analytical Instruments

Bio-medical Instruments- ECG, Blood Pressure measurements, Spectrophotometers, Electron Microscope, X-ray diffractometer, Noise and interference in Instrumentation, Instrumentation Amplifiers and Radio Telemetry.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on transducers, digital measurements and signal analyzers.

Books Recommended:

1. NihalKularatna, Digital and Analogue Instrumentation testing and measurement, The Institution of Electrical Engineers, 2003
2. J. G. Webster, Measurement, Instrumentation and Sensors Handbook, CRC Press, 1999.
3. T. S. Rathore, Digital Measurement Techniques, Narosa Publishing House, New Delhi.

Course No. ELE-15403C **Industrial Training and Seminar Work**
Paper type: Core **Credits: 0L+1T+2P**

I. Industrial Training:

The students are required to undergo training at some centre of excellence, outside the State, to get additional exposure in the new and emerging areas in the field of Electronics. Training Incharge/s from the Department shall accompany the students for making necessary academic and other arrangements at the host institute. At the end of the training programme, the performance of the students shall be evaluated by the host institute in collaboration with the Training Incharge.

II. Seminar Work

Each student shall be required to deliver a power point presentation on any topic pertaining to some latest area in the field of Electronics & Communication. Each student shall be evaluated for his/her Seminar Work by a team of faculty members headed by the Seminar Incharge.

Course No. ELE-15404C **Project Work**
Paper type: Core **Credits: 0L+0T+8P**

The students shall be divided into groups, with not more than 4 students in a group. Each group of students shall choose to work on a hardware/software project pertaining to the area of Electronics. The major theme of the project shall be to develop a prototype solution for a commercially needful application.

Each Project Group shall work under the supervision of Project Guide allocated within/outside the Department. The project Reports prepared by the students, as well as the working prototype shall be evaluated by an external Examiner.

Course No. ELE-15405DCE/ELE-15417GE **Computer Organization and Architecture**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Structure, Function and Measuring Performance

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl"s and Moore"s Laws.

Unit II: Memory Organization and Instruction Set Architecture

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence. Introduction to Virtual Memory, Overlays, Paging, Segmentation, Fragmentation, RAID and CAM. Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes.

Unit III: Register Set and I/O Organization

CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register Transfer, Bus and Memory Transfer, Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic, logical and shift units, Micro-operations and instruction execution, I/O Organization – I/O Module, its functions and structure, I/O Techniques, Introduction to I/O Interfaces.

Unit IV: Data Representation, ALU and Control Unit Design

Scalar Data Types Sign Magnitude, One"s and Two"s Complement representations of Integers, Integer Arithmetic"s (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic"s (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals, hardware and Micro-programmed /Wilkes Control unit, Micro-instructions and its formats, Control Memory. Introduction to Pipelining and Parallel Processing.

Laboratory Work:

The Laboratory work shall be based on units I through IV. It shall include digital design of binary adders, subtractors, comparators, fast adders, etc. Chip implementation of various arithmetical and logical circuits, Design of 4/8 bit ALU. Study of Booths algorithm and its hardware implementation, understanding format and representation of various data types in High and low level languages, Design of a floating point adder.

Books Recommended:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India

Course No. ELE-15406DCE/ELE-15418GE **Multimedia Technology and Security**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to Multimedia Systems and Processing

Introduction to multimedia systems, Multimedia signals, various sources of multimedia signals, Motivation for growth of multimedia theory, different elements of multimedia communication system, Challenges involved with multimedia signal processing and communication

Unit II: Lossless Compression

Redundant information in images.Lossless and lossy image compression. Elements of an image compression system, Huffman coding. Limitations of Huffman coding.Arithmetic coding (Basic principal). Encoding and Decoding procedure of an arithmetic coded bitstream. Coding limitations of arithmetic coding. Introduction to Lempel-Ziv and Run length coding

Unit III: Lossy Compression

Theory of Quantization, uniform and non-uniform quantization, scalar and vector quantization.Lloyd-Max quantizer.Rate-distortion function, Lossy predictive coding.Pixel encoding using Delta modulation, source coding theorem.

Unit IV: Information Security

Need for information security, Information Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains.Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Laboratory Work:

Introduction to image processing toolbox.Frequently used commands for image manipulation (IMSHOW, IMREAD, IMWRITE, RAND, RANDN, RANDPERM etc.), Image encryption using MATLAB.Implementation of LSB and ISB algorithms, Frequency domain data hiding in MATLAB.

Books Recommended:

1. Shuman and Thomson, Introduction to Multimedia, Tata Mcgrah Hill 2007.
2. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
3. N. J. Fliege, Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets, Wielypublishers ,1999
4. Lu, S.: Multimedia security: Stegnography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Course No. ELE-15407DCE/ELE-15419GE **Mobile communication**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Cellular System Fundamentals

Overview of Wireless Communication; Frequency Reuse and Cellular Concept; Co-Channel and Adjacent Channel Interferences; Cell Sectoring and Cell Splitting; Handoff Strategies; Channel Assignment Techniques

Unit II: Propagation Modeling

Propagation Path Loss; Shadowing; Path Loss Models; Multipath Fading; Narrowband Fading Models: Correlation and Power Spectral Density, Envelope and Power Distribution, Level Crossing Rate (LCR) and Average Fade Duration (AFD); Wideband Channel Models: Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time

Unit III: Modulation and Multiple Access Techniques

Performance of Digital Modulation over Wireless Channel; Diversity Techniques; Orthogonal Frequency Division Multiplexing (OFDM); Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Hybrid Techniques, OFDMA

Unit IV: Mobile Systems and Standards

Global System for Mobile Communications (GSM); CDMA Cellular System (IS-95); Evolution of Second-Generation (2G) Systems; Third-Generation (3G) Systems; Beyond 3G Systems.Wireless Local Loop; Mobile IP; Wireless Local Area Network (WLAN) Technology; IEEE 802.11 WLAN Standards; Ad Hoc Networking and Wireless Personal Area Networks.

Laboratory Work:

Implementation of Multiplexing Techniques, Calculation of Path Loss, Co-relation, Power Spectral Density, Study of various Channel Models, Study of GSM and CDMA Cellular Systems**.**

Books Recommended:

1. Wireless Communication; Principles and Practice; T.S.Rappaport
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996.
3. Wireless and Digital Communications; Dr. KamiloFeher (PHI)
4. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
5. Mobile Communication Engineering – Theory & Applications; TMH

Course No. ELE-15408DCE/ELE-15420GE **CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano electronics)**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit-I: Nanotechnology and Nano-Electronics

Introduction to Nanotechnology: size dependant physical properties, Melting point, solid state phase transformations, excitons, band-gap variations-quantum confinement, effect of strain on band-gap in epitaxial quantum dots. The p-n junction and the bipolar transistor; metal semiconductor and metal-insulator, Semiconductor junctions; field-effect transistors, MOSFETs,

Unit-II: Physics of Nanostructures

The Physics of Low-Dimensional Semiconductors: Square quantum well of finite depth, Parabolic and triangular quantum wells, Quantum wires, Quantum dots, Strained layers, Band structure in quantum wells, Semiconductor Quantum Nanostructures and Super-lattices: MOSFET structures, Heterojunctions, Quantum wells, Super-lattices, Electric Field Transport in Nanostructures: Parallel transport, Perpendicular transport, Quantum transport in nanostructures, Transport in Magnetic Fields and the Quantum Hall Effect

Unit-III: Electronic Devices Based on Nanostructures

HEMTs, MODFET, Hetero-junction bipolar transistors, Resonant tunnel effect, Hot Electron Transistors, Resonant Tunneling Transistor, Single Electron Transistor, Quantum Dots and Quantum Cellular Automata

Unit-IV: Optoelectronic Devices Based on Nanostructures

Heterostructure semiconductor lasers ,Quantum well semiconductor lasers ,Vertical cavity surface emitting lasers (VCSELs), Strained quantum well lasers, Quantum dot lasers, Quantum well and super lattice photo detectors, Quantum well modulators, Optical luminescence and fluorescence from direct band gap semiconductor nanoparticles, surface-trap passivation in core-shell nanoparticles

Laboratory Work:

The laboratory work shall include minimum 10 practicals across four units using suitable hardware/software platform.

Books Recommended:

1. Hari Singh Nalwa, Encyclopedia of Nanotechnology
2. Bharat Bhusan, Handbook of Nanotechnology, Springer
3. A. A. Balandin, K. L. Wang, Handbook of Semiconductor Nanostructures and Nanodevices
4. Cao, Guozhong, Nanostructures and Nanomaterials - Synthesis, Properties and Applications.
5. J. M. Martínez-Duart, R.J. Martín-Palma and F. Agulló-Rueda, Nanotechnology for Microelectronics and Optoelectronics, Elsevier B.V.

Course No. ELE-15409DCE/ELE-15421GE — **Fundamentals of RF Circuit Design**
Paper type: DCE/GE — **Credits: 2L+0T+2P**

UNIT I: Introduction to RF Design

Importance of RF Design, RF Behaviour of Passive Components, Chip Components and Circuit Board Considerations, General Transmission Line Equation, Micro Strip Transmission Lines, Single and Multi-Port Networks: Interconnecting Networks, Network Property and Application, Scattering Parameters.

UNIT II: Active RF Component and Modelling

RF Diode, Bipolar Junction Transistor, RF Field Effect Transistors, High Electron Mobility Transistor, Diode Models, Transistor Models, Characteristics of Amplifiers, Amplifiers Power Relation, Stability Considerations, Constant Gain, Noise Figure Circles, Constant VSWR Circles, Broad Band, High Power and Multistage Amplifiers.

UNIT III: RF Filter and Oscillator Design

Overview of RF Filter design, Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise, Amplifier design in various technologies, Power Amplifier design, Design issues in integrated RF filters. Basic Oscillator Model, High Frequency Oscillator Configuration.

UNIT IV: RF Mixer, VCO and PLL

Basic Characteristics of Mixers. Design of Mixers at GHz frequency range, various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Resonator VCO. designs, Radio frequency Synthesizers- PLL, Various RF Synthesizer architectures and frequency dividers

Laboratory Work:

The laboratory work shall include minimum 10 practicalsacross four units using suitable hardware/software platform.

Books Recommended:

1. Reinhold Ludwig, PavelBretchko, RF Circuit Design, Pearson Education Asia, 2001.
2. B Razavi, Design of Analog CMOS Integrated Circuit, McGraw Hill, 2000.
3. R. Jacob Baker, H.W. Li, D.E. Boyce, CMOS Circuit Design, layout and Simulation, PHI 1998.
4. Y.P. Tsividis, Mixed Analog and Digital Devices and Technology, TMH 1996
5. Thomas H. Lee, Design of CMOS RF Integrated Circuits, Cambridge University Press 1998.

Course No. ELE-15410DCE/ELE-15422GE **Bio-Medical Instrumentation**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT I: Electro-Physiology and Bio-Potential Recording

The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II: Bio-Chemical and Non Electrical Parameter Measurement

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, hearing aids, respiratory measurement, oximeter, Blood pressure, Temperature, pulse, Blood cell counters.

UNIT III: Assist Devices, Bio-Telemetry and Recent Trends

Cardiac pacemakers, DC Defibrillator, physiotherapy, diathermy, nerve stimulator, artificial kidney machine. Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

UNIT IV: Medical Imaging

Medical imaging, X-rays, laser applications, ultrasound scanner, echo-Cardiography, CT Scan MRI/NMR, cine angiogram, colour Doppler systems, Holter monitoring, endoscopy.

Laboratory Work:

Measurement of blood pressure, study of ECG and EEG lead systems, study of ECG and EEG graphs, temperature measurement, Respiratory measurement.

Books Recommended:

1. Leislie Cromwell, Biomedical instrumentation and measurement, Prentice Hall of India, New Delhi, 2002.
2. Khandpur, R.S., Handbook of Biomedical Instrumentation, TATA McGraw-Hill, New Delhi, 1997.
3. Joseph J. Carr and John M. Brown, Introduction to Biomedical equipment Technology, John Wiley and Sons, New York, 1997.

Course No. ELE-15411DCE/ELE-15423GE **Digital Image Processing**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Review of Image transforms: 2D-DFT, FFT

Unit II: Image Enhancement

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering,

Unit III: Image Restoration

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations.

Unit IV: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG and MPEG. Image Compression using MATLAB

Laboratory Work:

Introduction to Image processing Toolbox. Frequently used commands in image processing. Algebraicoperations on image data. Image filtering and restoration using MATLAB.Image compression using MATLAB.

Books Recommended:

1. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
2. Anil K. Jain “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly “The Data compression Book” 2 Ed, bpb Publications.
4. Pratt William K.,”Digital Image Processing”, John Wiley & sons
5. M.Sonka,V. Hlavac, R. Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publishing House

Course No. ELE-15412DCE/ELE-15424GE **Parallel Computation and Architecture**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1

Introduction: scope and issues of parallel computing, taxonomy of Parallel Architectures, Control Mechanism, Address-space Organization, Interconnection Networks, Processors Granularity, SIMD Architecture: Overview of SIMD Architecture. Design and Performance Issues, MIMD Architecture: Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, Parallel Vector Processors (PVP), Symmetric Multiple Processors (SMP), CC-NUMA, NUMA and COMA Architectures, Distributed Memory Architecture: Cluster Architecture -Design and other Issues MPP Architecture.

Unit II

Basics of Interconnection Networks: Interconnection Environments, Network Components, Network Characteristics, Network Performance Metrics, Network Topologies and Properties: Topologies and Functional Properties, Routing Schemes and Functions, Networking Topologies, Buses, Crossbar and Multistage Switches: Multiprocessor Buses, Crossbar Switches, Multistage Interconnection Networks, Comparison of Switched Networks, Gigabit Network Technologies: Fiber Channel and FDDI Rings, Fast Ethernet and Gigabit Ethernet, Myrinet for SAN/LAN Construction.

Unit III

Paradigms and Programmability: Algorithmic Paradigms, Programmability issues Parallel Programming Examples, Parallel Programming Models: Implicit Parallelism, Explicit Parallel Models, Other Parallel, Programming Models, Shared Memory Programming: The POSIX Threads (Pthreads) Model, The Open MP Standard, Message-Passing Programming: The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM), Data Parallel Programming: The Data Parallel Model, The Fortran 90 Approach, Ottler Data Parallel Approaches.

Unit IV

Performance Metrics for Parallel Systems: Run Time, Speedup, Efficiency Cost, Scalability and Speedup Analysis: Amdahl's Law: Fixed Problem Size, Gustafson‟s Law: Fixed Time, Sun and Ni's Law: Memory Bounding, ISO performance Models, Sources of Parallel Overheads: Inter-processor Communication, Load Imbalance Extra Computation, System and Application Benchmarks: Micro Benchmarks, Parallel Computing Benchmarks. Business and TPC Benchmarks, SPEC Benchmark Family.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Kai Hwang and ZhiweiXu, "Scalable Parallel Computing", 1997, McGraw Hill New York.
2. Vipin Kumar, et. al "Introduction to Parallel Computing, Design and Analysis of Algorithms", 1994, Redwood City, CA, Benjmann/ Cummings.
3. Barry Wilkinson and Michael Allen, "Parallel Programming", 1999, Pearson Education Asia.
4. AI Geist, Adam Beguelin, Jack Dongarra, Weicheng Jiang, Robert Manchek and VaidySunderam,
5. "PVM: Parallel Virtual Machine -A Users' Guide and Tutorial for Networked Parallel Computing", 1994, MIT Press.

Course No. ELE-15413DCE/ELE-15425GE — **Cyber Security and Forensics**
Paper type: DCE/GE — **Credits: 2L+0T+2P**

Unit 1: Introduction to Security Threats

Intruders and Hackers, Insider threats, Cybercrimes. Network Threats: Active/ Passive – Interference – Interception –
Impersonation – Worms –Virus – Spam‟s – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security. SQL command injection, Buffer overflow attacks, phishing, and cross-site scripting (XSS), Code injection, Time-of-check-to-time-of-use race conditions, Sybil attack, Distributed Denial of Service and other network attacks. Systems Security, Botnets, and Spoofing, Pharming Attacks, TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing, SYN attacks, Smurf, attacks, UDP flooding.

Unit II: Web Security

Intrusion Detection and Prevention, Web security requirements, XML, SOAP, WSDL and UDDI, WS-Security, SAML, Ws-Trust, WS-Security Policy, Secure Sockets Layer (SSL), Transport Layer Security (TLS), and Secure Electronic Transaction (SET), HTTPS, Secure Shell (SSH), IP Security: IP Security overview, Architecture, Authentication, Encapsulating security payload, Combining security associations, Key management.

Unit III: E-mail Security

Pretty Good Privacy: Notation, Operational Description, Cryptographic Keys and Key Rings, Public-Key Management, S/MIME: RFC 5322, Multipurpose Internet Mail Extensions, S/MIME Functionality, S/MIME Messages, S/MIME Certificate Processing, Enhanced Security Services, Domain Keys Identified Mail: Internet Mail Architecture, E-mail Threats, DKIM Strategy, DKIM Functional Flow.

Unit IV: Forensics

Forensic Types: Disk Forensics, Network Forensics, Mobile Device Forensics, Live Forensics, Memory Forensics, Multimedia Forensics, Internet Forensics, Cyber Crime Investigations and Digital Forensics, Cyber Laws and Security Policies, Cybercrime, Forensic process, Legal process and Law enforcement, ACPO guidelines, Digital evidence, Incident response, Searching and analysis tools, Investigative tools (Open Source and Proprietary), Email & Browsers, Intrusion detection, Attack trace-back, Packet inspection, Log analysis, Hashing issues, Anti-forensics (encryption and stealth techniques), Cloud computing. Disk Forensics, Using Forensic Software such as FTK, Encase etc.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Kenneth C.Brancik “Insider Computer Fraud” Auerbach Publications Taylor & Francis Group.
2. AnkitFadia “Ethical Hacking” 2nd Edition Macmillan India Ltd.
3. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics).
4. John W. Rittinghouse, William M. Hancock, “Cyber security Operations Handbook”, ElsevierPub.

Course No. ELE-15414DCE/ELE-15426GE **Broadband Wireless Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Broadband Networks

Review of Broadband communication networks DSL, ADSL, HDSL, SDSL, VDSL, Introduction to Broadband Wireless, Evolution of broadband Wireless

Unit II: Generations of Broadband Networks

Narrowband, First Generation, Second Generation, Emergence of Standard Based Technology, Mobile Broadband Wireless: Market Drivers and Applications, WiMAX and Other Broadband Wireless Technologies

Unit III: 3G Standards

Brief of 3G cellular systems, WiFi Systems, WiMAX versus 3G and WiFi, Other comparable systems, Spectrum options for broadband wireless, Business and technical challenges of broadband wireless and WiMAX

Unit IV: Beyond 3G – Multicarrier Systems

Overview of WiMAX: IEEE 802.16 and WiMAX, Salient features of WiMAX, WiMAX Physical and MAC layer Overview, OFDM Basics, OFDM in WiMAX, Advanced features for performance improvement, WiMAX Reference Network Architecture, Handoff Mechanism, Different types of Services, QoS Architecture.

Laboratory Work:

Study of broad band networks using network and R.F. Communication tools

Books Recommended:

1. Jeffrey G. Andrews, ArunabhaGhosh and RiasMuhamed, "Fundamentals of WiMAX : understanding broadband wireless networking", Pearson Education, 2007.
2. Mobile WiMAX : toward broadband wireless metropolitan area networks / editors, Yan Zhang and Hsiao-Hwa Chen, Auerbach Publications, 2007.

Course No. ELE-15415DCE/ELE-15427GE **Embedded System Design**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT–I: Embedded systems and processor
Introduction to embedded systems, components of an embedded system, types of embedded system, levels of embedded system, Embedded System applications, Embedded system design considerations, Embedded Processors: Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessmentof Embedded Processors. Embedded memory devices and Embedded I/O. Embedded high and low level programming.

UNIT-II: Microcontrollers
Microcontrollers for embedded systems, classes of microcontrollers, types of microcontrollers, introduction to microcontroller platforms: ARM,ATMEL/AVR,PIC,ARDUINO,Raspberry and 8051. Choosing a Microcontroller for an embedded application.

UNIT-III: 8051 Architecture
8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture, bare inimum system with external circuits, other members of 8051. Instructions and Programming : Addressing modes :accessing memory using various addressing mode, Jump, Loop and call instructions,time delay generation and calculation, Single bit instructions and programming, I/O port programming: I/O programming, bit manipulation.

UNIT – IV: 8051 Timers,Counters, Serial Communication , Interrupts and their Programming
Timer and counter architecture in 8051,programming 8051 timers, counter programming, pulsefrequency and pulse width measurements. Serial communication in 8051:Basics of serial communication, 8051 connection toRS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051,programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.

Laboratory Work:

Interfacing memory with 8051, Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing DC motor, Relay, Solenoid, Steppermotor, Servomotor.

Books Recommended:

1. Raj Kumar, "Embedded Systems: Architecture, Programming and Design", Tata McGraw Hill, Third Reprint, (2003).
2. John Catsoulis, O"Reilly, "Designing Embedded Hardware", First Indian Reprint, (2003).
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
4. Kenneth J. Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.

Course No. ELE-15416DCE/ELE-15428GE **Modeling and Simulation of Wireless Communication Systems**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Modeling and Simulation Approach

Review of stochastic process and their properties. Methods of performance evaluation-simulation approach- Advantages and limitations. System model steps and its types involved in simulation study. Basic concepts of modeling – modeling of systems, devices, random process and hypothetical systems. Error sources in simulation. Validation, simulation environment and software issues.Role of simulation in communication system and random process. Steps involved in simulation study.

Unit 2: Generation and Parameter Estimation

Monte Carlo simulation, properties, random number Generation, Generating independent and correlated random sequences. Testing of random number generators.

Parameter estimation:

Estimating mean, variance, confidence interval, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Power Spectral Density of a process, Delay and Phase

Unit-3: Modeling Of Communication Systems

Information sources, source coding, base band modulation, channel coding, RF and optical modulation, filtering, multiplexing, detection/demodulation- carrier and timing recovery for BPSK and QPSK.Modeling considerations for PLL.

Unit-4: Communication Channel Models

Fading and multipath channels- statistical characterization of multipath channels and time-varying channels with Doppler effects, models for multipath fading channels. Finite state channel models – channels with and without memory. Methodology for simulating communication systems operating over fading channels.

Laboratory Work:

Random Process Modeling and Simulation using matlab, Power Spectral Density of a process, Delay and Phase, study of filtering,dtetection/modulation using matlab, Modelling of PLL, Study of Doppler shifts, Matlab implementation of fading channels (Rayleigh, Rician and Clarkes Model)

Books Recommended:

1. "Principles of Communication Systems Simulation 2004, ISBN 0-13-494790-8. S. Shanmugan, T. S. Rappaport, K. L. Kosbar, Prentice Hall,
2. Simulating Wireless Communication Systems: PractPrentice Hall, 2004, ISBN: 0-13-022268-2

Course No. ELE-15429OE **Automobile Electronics**
Paper type: OE **Credits: 1L+0T+2P**

Batteries and Accessories; Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

Starting and Charging System; Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.
Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

Fundamentals of Automotive Electronics; Current trends in automotive electronic engine management system, Electro magnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

Sensors and Activators; Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

Lab Work
Visits to some Automobile Workshop for practical training.

Books Recommended:

1. A.P. Young and L. Griffiths, Automotive Electrical Equipment, ELBS & New Press, 1999.
2. William B. Riddens “Understanding Automotive Electronics”, 5th edition - Butter worth Heinemann Woburn, 1998.

Course No. ELE-15430OE **Electronics for Hobbyists**
Paper type: OE **Credits: 2L+0T+2P**

Note: *The Teacher shall demonstrate and involve the students on practical training on each topic*

Passive components: Different types of: resistors, inductors, capacitors, potentiometers, Transformer, step down/step-up, auto transformer, Wattage/Specifications/Color Coding of passive components.

Electronic Workshop Tools: Bread board, Copper clad laminate sheet, Solder iron, solder-stand, solder-wire, flux, flexible wire, hookup wire, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, desolder pump, De-solder wick, drilling machine.

Diodes, Introduction, Zener diode, Varactor diode, LED, IN4001 to 07, IN4148; 2N5402, 2N5408, BY127, BJT, FET.

Voltage Sources: Concept of Voltage and Current, AC/DC Voltage, AC Power supply, DC battery (Pencil cell :1.5V, AAA,AA Type, +9V, Rechargeable Cell, Mobile battery, DC power supply.

Measuring Instruments: (Introduction) Voltmeters, Ammeters, Watt meters, Multimeter, LCR-Q meter, Power Supply, CRO, DSO, Function Generator, Frequency counter.

Transistors & ICs: Introduction, Transistors BC107, BC177, BC547/548, SL100, SK100, AC127/128, BF194, TIP122, Photo transistor - voltage regulator IC78XX, 79XX, LM317 - Packages of various SMD components: Resistor, Capacitor, Inductor, Op-Amp, Timer, Logic Gates and Digital Circuits, 74XX ICs.

Sensors and displays: LDR, Thermosensors, photosensors, Solar Cell, Photocell, Optocoulpler, Seven Segment Display, LCD Display.

Electronic circuit Drawing, Series and Parallel network using Resistors, Capacitors, Circuit diagram for: Forward/reverse biased PN Junction diode - Half wave, Full wave and Bridge Rectifier using diode.

Electronic circuits on bread board: Simple circuit fabrication on Bread-Board.

Electronic circuit on general purpose PCB: Simple Circuits on general purpose PCB, Soldering/De-soldering, Tracing of circuit on PCB, Fabrication of PCB, troubleshooting of circuits on PCB.

Hobby Circuits, Fabricating DC Adapter, Battery Charger, Stabilizer, Alarm Circuits using sensors etc.

Books Recommended:

1. Basic Electronics - For Tommorrow's Inventors; by Nick Dossis. Thames and Kosmos Publishers.
2. Getting Started in Electronics by Forrest. M. Mims (www.circuitstoday.com)
3. Make Electronics Learning by Discovery by Charles Platt (www.circuitstoday.com)

DETAILED SYLLABUS

under

Choice Based Credit System(CBCS) Scheme

for

M. Sc. Programme in Electronics

(Academic Session 2017 and onwards)

Approved by BOS, held on 23-07-2017

P. G. Department of Electronics and Instrumentation Technology

University of Kashmir, Hazratbal, Srinagar-190006, J&K

Course Structure

Course: *M. Sc. (Electronics) SEMESTER - I*												
Course Code	**Course Title**	**Category**	**Credits**				**Marks**					
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**	**Lab**	**Total**
ELE17101C	Circuit Analysis and Synthesis	Core	2	0	2	3	25	NA	25	25	75
ELE17102C	Antennas and Wave Propagation	Core	2	0	2	3	25	NA	25	25	75
ELE17103C	Linear Integrated Circuits and Applications (LICA)	Core	2	0	2	3	25	NA	25	25	75
ELE17104C	Digital Electronics and C-Programming Lab	Core	1	0	4	3	25	NA	0	50	75
ELE17105DCE	Engineering Mathematics	DCE	4	0	0	4	25	25	50	NA	100
ELE17106DCE	CMOS VLSI and Nano-Electronics –I(MOSFET Theory)	DCE	3	0	2	4	25	NA	50	25	100
ELE17107DCE	Signals and Systems	DCE	3	0	2	4	25	NA	50	25	100
ELE17108DCE	Electronics Engineering Materials and Components	DCE	3	0	2	4	25	NA	50	25	100
ELE17109DCE	Statistical Communication Theory	DCE	3	0	2	4	25	NA	50	25	100
ELE17110DCE	Opto-Electronic Devices	DCE	3	0	2	4	25	NA	50	25	100
ELE17111DCE	Data and Computer Communication	DCE	3	0	2	4	25	NA	50	25	100
ELE17001GE	Foundations of Engineering Mathematics	GE	2	0	0	2	NA	NA	50	NA	50
ELE17002GE	Fundamentals of Signals and Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE17003GE	Fundamentals of Data Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE17004GE	Programming and Problem Solving Techniques	GE	1	0	2	2	NA	NA	50	NA	50
ELE17001OE	Computing and Informatics -I	OE	1	0	2	2	NA	NA	50	NA	50
ELE17002OE	Electronic Devices & Circuits-I	OE	1	0	2	2	NA	NA	50	NA	50

Course: *M. Sc. (Electronics) SEMESTER - II*												
Course Code	**Course Title**	**Category**	**Credits**				**Marks**					
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**	**Lab**	**Total**
ELE17201C	Analog Communication Systems	Core	2	0	2	3	25	NA	25	25	75
ELE17202C	Microprocessor Architecture and Programming	Core	2	0	2	3	25	NA	25	25	75
ELE17203C	Power Electronic Circuits and Systems	Core	2	0	2	3	25	NA	25	25	75
ELE17204C	Microwave Engineering	Core	2	0	2	3	25	NA	25	25	75
ELE17205DCE	VLSI Technology	DCE	4	0	0	4	25	25	50	NA	100
ELE17206DCE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	DCE	3	0	2	4	25	NA	50	25	100
ELE17207DCE	Optical Communication and Networks	DCE	3	0	2	4	25	NA	50	25	100
ELE17208DCE	Design and Analysis of Active Filters	DCE	3	0	2	4	25	NA	50	25	100
ELE17209DCE	Simulation and Modeling using MATLAB	DCE	3	0	2	4	25	NA	50	25	100
ELE17210DCE	Wireless Adhoc and Sensor Networks	DCE	3	0	2	4	25	NA	50	25	100
ELE17211DCE	Communication Hardware Design	DCE	3	0	2	4	25	NA	50	25	100
ELE17005GE	Optical Fibre Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE17006GE	System Simulation using MATLAB	GE	2	0	0	2	NA	NA	50	NA	50
ELE17007GE	Data Structures	GE	2	0	0	2	NA	NA	50	NA	50
ELE17008GE	Wireless Sensor Networks	GE	1	0	2	2	NA	NA	50	NA	50
ELE17003OE	Computing and Informatics -II	OE	1	0	2	2	NA	NA	50	NA	50
ELE17004OE	Electronic Devices & Circuits-II	OE	1	0	2	2	NA	NA	50	NA	50

Course: *M. Sc. (Electronics) SEMESTER - III*												
Course Code	**Course Title**	**Category**	**Credits**				**Marks**					
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**	**Lab**	**Total**
ELE17301C	Physics of Semiconductor Devices	Core	2	0	2	3	25	NA	25	25	75
ELE17302C	Control System Engineering	Core	2	0	2	3	25	NA	25	25	75
ELE17303C	Digital Signal Processing	Core	2	0	2	3	25	NA	25	25	75
ELE17304C	Computer Networks	Core	2	0	2	3	25	NA	25	25	75
ELE17305DCE	Microcontroller Architecture and Programming	DCE	3	0	2	4	25	NA	50	25	100
ELE17306DCE	CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design)	DCE	3	0	2	4	25	NA	50	25	100
ELE17307DCE	Digital System Design using HDL	DCE	3	0	2	4	25	NA	50	25	100
ELE17308DCE	Speech and Audio Processing	DCE	3	0	2	4	25	NA	50	25	100
ELE17309DCE	Advanced Communication Systems	DCE	3	0	2	4	25	NA	50	25	100
ELE17310DCE	RF Engineering	DCE	3	0	2	4	25	NA	50	25	100
ELE17311DCE	Soft Computing and Neural Networks	DCE	4	0	0	4	25	25	50	NA	100
ELE17312DCE	Cryptography and Information Security	DCE	3	0	2	4	25	NA	50	25	100
ELE17313DCE	Advanced Microprocessors	DCE	3	0	2	4	25	NA	50	25	100
ELE17009GE	Embedded Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE17010GE	Modern Communication Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE17011GE	Fundamentals of Fuzzy Logic	GE	2	0	0	2	NA	NA	50	NA	50
ELE17012GE	Fundamentals of Information Security	GE	2	0	0	2	NA	NA	50	NA	50
ELE17005OE	Computing and Informatics -III	OE	1	0	2	2	NA	NA	50	NA	50
ELE17006OE	Electronic Devices & Circuits-III	OE	1	0	2	2	NA	NA	50	NA	50

Course: *M. Sc. (Electronics) SEMESTER - IV*												
Course Code	**Course Title**	**Category**	**Credits**				**Marks**				
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**	**Lab**	**Total**
ELE17401C	Digital Communication and Information Theory	Core	2	0	2	3	25	NA	25	25	75
ELE17402C	Electronic Instrumentation	Core	2	0	2	3	25	NA	25	25	75
ELE17403C	Industrial Training and Seminar Work	Core	0	0	6	3	25	NA	NA	50	75
ELE17404C	Project Work	Core	0	0	6	3	25	NA	NA	50	75
ELE17405DCE	Computer Organization and Architecture	DCE	3	0	2	4	25	NA	50	25	100
ELE17406DCE	CMOS VLSI and Nano-Electronics –IV (Nanotechnology & Nano-electronics)	DCE	3	0	2	4	25	NA	50	25	100
ELE17407DCE	Wireless Cellular Communication	DCE	3	0	2	4	25	NA	50	25	100
ELE17408DCE	Multimedia Technology and Security	DCE	3	0	2	4	25	NA	50	25	100
ELE17409DCE	Fundamentals of RF Circuit Design	DCE	3	0	2	4	25	NA	50	25	100
ELE17410DCE	Biomedical Instrumentation	DCE	3	0	2	4	25	NA	50	25	100
ELE17411DCE	Digital Image Processing	DCE	3	0	2	4	25	NA	50	25	100
ELE17412DCE	Cyber Security and Forensics	DCE	3	0	2	4	25	NA	50	25	100
ELE17413DCE	Broadband Wireless Networks	DCE	3	0	2	4	25	NA	50	25	100
ELE17013GE	Foundations of Computer Organization	GE	2	0	0	2	NA	NA	50	NA	50
ELE17014GE	Mobile Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE17015GE	Fundamentals of Biomedical Instrumentation	GE	2	0	0	2	NA	NA	50	NA	50
ELE17016GE	Principles of Digital Image Processing	GE	2	0	0	2	NA	NA	50	NA	50
ELE17017GE	Internet of Things (IOT)	GE	2	0	0	2	NA	NA	50	NA	50
ELE17007OE	Computing and Informatics -IV	OE	1	0	2	2	NA	NA	50	NA	50
ELE17008OE	Electronic Devices & Circuits-IV	OE	1	0	2	2	NA	NA	50	NA	50

NOTES

1. Assessment-1 (A-1) for all Core and DCE Courses shall be based on Unit-I of the syllabus.
2. Assessment-2 (A-2)for those DCE Courseswhich do not have a lab componentshall be based on Unit-II of the syllabus and there shall be no Assessment-2 (A-2) for DCE Courses which have a laboratory component.
3. End Term examinationfor Core Courses shall be based on Unit-II of the syllabus.
4. End Term examinationfor DCE Courses which do not have a lab component shall be based on Unit-III and Unit-IV of the syllabus.
5. End term examination for those DCE Courses which have a lab component shall be based on Unit-II and Unit-III of the syllabus.
6. Lab examination of Core and DCE Courses shall be held separately.
7. Term end examination of GE and OE courses having Lab components shall include Lab examination which shall be held on the same day.
8. Pattern of Question Paper:

a) Examination with Max. Marks=25 (Duration=60 minutes)

Section A: Questions carrying One mark each- 08 objective questions = 08 Marks.
Section B: Questions carrying Four marks each- 02 questions = 08 Marks.
Section C: Questions carrying Nine marks each- 02 questions (Only 1 to be attempted) = 09 Marks.

b) Examination with Max. Marks=50 (Duration=120 minutes)

Section A: Questions carrying One mark each- 16 objective questions = 16 Marks.
Section B: Questions carrying Four marks each- 04 questions = 16 Marks.
Section C: Questions carrying Nine marks each- 04 questions (Only 2 to be attempted) = 18 Marks.

Semester - I								
ELE17101C: Circuit Analysis and Synthesis							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	2	3	25	NA	25	25	75

Unit I: Graph Theory, Network Equations and Two Port Parameters

Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Network Matrices, Incidence Matrix, Loop Matrix, Loop, Cut -Set Matrix, Cut Set, Mesh Equations, Nodal equations, Source Transformations, Various Two Port parameters, O. C. Impedance and S. C. Admittance Parameters, parameters, chain Parameters, Image Impedance, Applications of various Two port Parameters to T and π - networks, Relationship between different two port parameters, Interconnection of Two port equivalent networks.

Unit II: Network Functions, Responses and Synthesis

Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Formulation of state equations for Electrical Networks and their solutions. Introduction to passive network synthesis, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immittance Functions *(realized by Foster-I and Foster IIform, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC AdmittanceFunctions.

Unit III: Laboratory Work

Verification of Source Transformation and TellegensTheorms, Calculation of various two port parameters, To study impulse response of a first order system, To study oscillatory response and its relation with pole location. Synthesis of some passive networks

Books Recommended:

1. Networks and Systems by D.R.Choudury, Wiley Eastern Ltd: New Delhi.
2. Network Analysis By M. E. Valkenburg, Prentice Hall India.
3. Basic Circuit Theory by Charles A. Desoer and Ernest S. Kun, McGraw H
4. Circuit Analysis with Computer Application to Problem Solving by Gupta, BaylessandPiekari, Willey Eastern Ltd, New Delhi
5. Network Analysis theory and compute methods by donson and Watkins, Prentice Hall,New Delhi.

Semester - I								
ELE17102C: Antennas and Wave Propagation							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	2	3	25	NA	25	25	75

Unit I: Maxwell's Equations and Electromagnetic Waves

Maxwell's Equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Boundary condition, Boundary Conditions at media interface (Dielectric and Conducting interface).Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, power flow and pointing vector (Physical interpretation), plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface.

Unit II: Antenna Radiation Mechanism and Structures

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna. Folded dipole antennas, modification of folded dipoles, loop antennas, far-field patterns of circular loop antennas, introduction to microstrip antennas.

Unit III: Laboratory Work

Measurement of Antenna Parameters using Microwave Antenna Training System, Plot of Polarization (Horizontal and Vertical). Design of dipole antenna system using waveguide.some experiments using Microwave Antenna Trainer and CST Tool or HFSS.

Books Recommended:

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition.
2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill.

Semester - I								
ELE17103C: Linear Integrated Circuits and Applications (LICA)							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	2	3	25	NA	25	25	75

Unit I: Operational Amplifier Characteristics Applications

Differential Amplifier, Current Mirrors, Active Loads, Non- ideal parameters of OP- AMPs, Frequency response of OP- Amps, Compensation, Pole – Zero compensation, Dominant pole compensation, Linear Applications of Op-amps: Amplification (Inverting Amplifier, Non-inverting Amplifier, Instrumentation Amplifier),Integration and Differentiation; Electronic analog computation, Active filters, Sample and hold systems, Analog multiplexer, Logarithmic and Exponential amplifiers, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation).

Unit II: Wave shaping and Wave generators

Rectifiers, Clippers and Clampers, Peak Detector, Comparators, Applications of comparators, Schmitt-trigger, Square wave and triangular wave generators, pulse generators, voltage time-base generators, Step (Stair-case) generators, sinusoidal Oscillators: Phase shift oscillator, Wien-bridge oscillator, 555 timer: Applications as Astable and Monostable Multivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Unit III: Laboratory Work

The laboratory work shall include minimum 10 practicals on Op-Amp Characteristics, Linear applications; Wave shaping, signal generation, PLL and 555 timer.

Books Recommended:

1. Milliman, Integrated Electronics, McGraw hill Book company
2. Milliman and Grabel, Microelectronics, McGraw Hill Company
3. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Mc-Graw Hill, 2002.
4. R. A. Gayakward , OP- Amp and Linear Integrated Circuits, Prentice Hall of India Ltd.

Semester - I								
ELE17104C: Digital Electronics and C-Programming Lab							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
1	0	4	3	25	NA	0	50	75

Unit I: Experiments on Digital Electronics-I

1 To design basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) using discrete components.
2 To design basic logic gates (AND, OR, NOT) using universal gates.
3 To verify Boolean expressions using basic and universal gates.
4 To design and realize Half and Full Adder Circuits using basic logic gates/universal gates. To design a 4-bit magnitude comparator using basic/universal logic gates.
5 To design a digital clock using ICs.

6, a) To design a 4:1 multiplexer and 1:4 de-multiplexer circuits using basic/universal logic gates.
b) To implement a 4/5 variable Boolean function using a suitable MUX.

7. a) To design a 2^n to n line encoder using basic universal logic gates.
b) To design a control signal generator for 2^n :1 MUX and 1: 2^n DEMUX using decoder.

8. a) Design a BCD to 7 segment decoder using IC"s (7447).
b) To design a circuit that can encode a particular sequence and decode the same sequence.
c) To design a ROM that can store a particular sequence.

Unit II: Experiments on Digital Electronics-II

1. To implement a 4/5 variable Boolean function using ROM and decoders.
2. (a) To design the following flip-flops using universal gates.
   I) S-R flip-flop II) D flip-flop III) J-K flip-flop and IV) T flip-flop
   (b) Study race around condition of J-K flip-flop and design edge-triggered J-K-flip flop and M/S flip-flop to eliminate race around condition.
3. (a) To design an n-bit serial adder using full adder and D type flip flop IC"s.
   (b) To design a universal shift register and demonstrate SISO, SIPO, PISO and PIPO functions.
4. (a) To design a modulo-n Asynchronous and synchronous counter using JK/T-Flip Flop IC"s.
   (b) To design up-down synchronous counter with direction control that can count a particular sequence.
   (c) To design Johnson& Ring counter.

Unit III: Programming with C Language-I

1. (a) Write a program to evaluate the sine using recursive and non-recursive functions.
2. Write down and execute a C-Programme for the following:

(a)To determine the value of a given Resistor from its color Code.

(b) To match a frequency with the various divisions of the frequency spectrum and display its location.

(c) To check whether a transistor is NPN or PNP

(d) To accept the name of a transistor and output the package type, manufacturer, operating frequency range, and material used.

(e) To accept parameters of a transformer and calculate its output voltage

(f) To accept one of the three parameters (peak voltage, average and rms) of a signal and calculate the other two parameters in half-wave and full-wave rectifier along with ripple factor.

(g) To accept the changes in the current IB, IC, and IE of a transistor and calculate the current amplification factors in cases of common-base, common-emitter, and common-collector amplifiers.

(h) To calculate the extreme points of a load line and operating point using the given parameters.

(i) Current flowing through a Semiconductor diode is given by

$$I_D = Is[\exp(v_D/nv_{th}) - 1]$$

Where VD is Voltage across diode, Is is saturation current, n is Emission coefficient and Vth is Thermal voltage. Write a program to calculate and plot the current flowing through the diode for voltages from –4.0 Volts to 1.0 Volts in steps of 0.1.

3. a) Write down a program which will convert a decimal number to its equivalent representations in hexadecimal, octal and binary number systems. The program should display the number in all of above number systems.

b) Write a C program that converts a decimal number to its equivalent number in new base. The decimal number and the new base are to be read as command line arguments.

4. Write down a program to compute

a) Equivalent resistance of the resistors connected in: I)Series II)Parallel.

b) Equivalent resistance of the capacitors connected in: I)Series II) Parallel.

c) Equivalent resistance of the inductors connected in: I)Series II) Parallel.

5. a) Write down a program to calculate the output voltage for Damped Sinusoidal Oscillator.

b) Write down a program to calculate the oscillating frequency of a damped RLC circuit.

c) Calculate the energy stored in an inductor which is given by:

$$E = ½ \times \text{inductance} \times \text{current } 2$$

6. Write down a program to calculate the total percentage Harmonic Distortion of a device for the given strengths of fundamental and harmonic components.

7. Write a program to accept the color code of resistors and sort them in ascending or descending order of their values using arrays.

8. Write a to read a string and a key. Encrypt the string using this key. Display the encrypted string. In the same program read the key again decrypt the string and display the original string using functions.

9. Writea computational program for solving simultaneous algebraic equations by Guassian Elimination method and use it for solving a given linear network.

Books Recommended:

1. Malvino and Leach "Digital principles and Applications" Tata McGraw Hill.
2. Jain R P "Modern Digital Electronics", Tata McGraw-Hill, Third Edition, (2003)

3. Mano M Morris, "Digital Design" Pearson Education, Third Edition, (2006)
4. Deitel, "C How To Program"
5. Byron Gottfried "Programming with C"
6. E. Balaguruswamy, "Programming with ANSI-C"

Semester - I

ELE17105DCE: Engineering Mathematics — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
4	0	0	4	25	25	50	NA	100

Unit I: Fourier Series

Periodic Functions, Fourier Series: Determination of Fourier Coefficients, Fourier Series of periodic functions, even and odd functions, Fourier Series for arbitrary period, Half Range Series, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals.

Unit II:Fourier Transform

Dirichlet's Condition, Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit III: Laplace Transformation

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform in Electrical Networks.

Unit IV: Function of Complex Variable

Analyticity of Complex variables, Cauchy Riemann Conditions, Cauchy integral Theorem, Laurent's Series, Singularities, Poles, Residues, Residue Theorem, Contour integration for Trigonometric functions (0 to 2π) , Contour Integration for functions ($-\infty$ to $+\infty$), Application of Functions of Complex variables in System Stability.

Books Recommended:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.
4. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A.Fairley, John Wiley & Sons
5. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.
6. Statistical Methods by S. P. Gupta, S Chand and Company.
7. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH
8. Fourier Transformation and Laplace Transformations, Schaum Series Book ,TMHCourse

Semester - I

ELE17106DCE: CMOS VLSI and Nano-Electronics –I (MOSFET Theory) — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: MOSFET Operation

Long Channel MOSFET devices: Drain current model, MOSFET I-V characteristics, Regions of operation, sub-threshold characteristics, MOSFET channel mobility, MOSFET capacitance and inversion layer capacitance effect, MOSFET parasitic elements. MOS transistor with Ion-Implanted channels: Enhancement n-MOS transistors, Depletion n-MOS transistors, Enhancement p-MOS transistors.

Unit II: Threshold Voltage and Small Channel Effects

Threshold Voltage: Threshold variation with device length and width and temperature dependence of threshold voltage. Small channel effects: Channel length modulation, barrier lowering, two dimensional charge sharing and threshold voltage, Punch Through, Carrier velocity saturation, Hot carrier effect-substrate current, gate current and breakdown, effect of surface and drain series resistance, effects due to thin oxides and high doping.

Unit III: MOSFET Scaling and Parasitics

Scaling theory in MOSFETs: Effect of scaling theory on drain current, device capacitances, delay, power dissipation, Transconductance and output impedance. VLSI device structure: Gate material, non-uniform channel doping, source drain structures, device isolation, MOSFET parasitic elements, MOS capacitor with no applied voltage and at non-zero bias.

Unit IV: Laboratory Work

The laboratory work shall include minimum of 10 practicals on MOSFET characteristics, Modeling and PSPICE

Books Recommended:

1. N. Arora, MOSFET Models for VLSI Circuit Simulation, Springer-Verlag Wien New York.
2. Yuan Taur and Tak H. Ning, Fundamentals of modern VLSI Devices, Cambridge University Press.
3. YannisTsividis, Operation and Modeling of MOS transistor, WCB/McGraw-Hill, New York.

Semester - I

ELE17107DCE: Signals and Systems — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to Signals, Systems and Transform Techniques

Representation and Classifications of Continuous and Discrete Time Signals and Systems; Fourier Series Representation; Singularity Functions; Convolution Integral; Impulse Response and Its Properties, Fourier Transform and Its Properties; Sampling; Discrete Time Fourier Transform; Discrete Fourier Transforms.

Unit II: Analysis Using Transforms

Review of Laplace Transform; Hilbert Transform System Analysis Using Fourier and Laplace Transforms of I & II Order Systems; Transfer Function; Z-Transform and Its Properties Discrete Time System Analysis Using Z-Transform.

Unit III: Random Signals

Review of Random Variables; Probability Distribution and Probability Density Functions; Uniform, Gaussian, Exponential and Poisson Random Variables; Statistical Averages; Random Processes; Correlation; Power Spectral Density; Analysis of Linear Time Invariant Systems With Random Input; Noise and Its Representations

Unit IV: Laboratory Work

Generation of various signals and sequences using MATLAB. Computation of Correlation and convolution of various signals using MATLAB. Fourier Transform and DFT computation, Study of sampling and quantization. Study of PSD of various signals. System solutions.

Books Recommended:

1. Alan V, Oppenheim and A.S Wilsky, Signals and Systems, prentice Hall India
2. Simon Hykin, Signals and systems, John Wiley.
3. B. P Lathi, Signals and systems
4. Simon hykin, Communication systems, John wiley

Semester - I

ELE17108DCE: Electronics Engineering Materials and Components — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Electrical and Magnetic Properties of Materials

Classification of electrical materials; Fundamentals of Atomic Structure and Chemical Bonding; Structure and properties of conductors, semi-conductors and insulators, Structure and properties of magnetic materials, ferroelectric, piezo-electric, ceramic optical and superconducting materials. Structure of solids : Crystalline and Non-crystalline states; Crystallographic directions and phases; Determination of crystal structures.

Unit II:Electronic Components

Passive components; Resistors, capacitors, inductors and their types; color coding; ferrites, Quartz crystal and ceramic resonators, electromagnetic and electromechanical components.

Unit III: Physical Electronics

Electrons and holes in semiconductors; Hall effect; mechanism of current flow in a semi-conductor, junction theory, different types of diodes and their characteristics (rectifying, Zener, LED, Photo). Introduction to three terminal devices (BJT and FET).

Unit IV: Laboratory Work

The students are required to conduct at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. Electronic Devices and Circuit Theory. By: Robert Boylston& Louis Nashelsky. Prentice Hall.
2. Elements of Materials Science & Engineering. By: L.H. Van Vlack. Addison-Wesley Publishing Company, New York.

Semester - I

ELE17109DCE: Statistical Communication Theory — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Random Variables and Random Process

Discrete Time Random Processes: Random Variables, Uncorrelated and Orthogonal Random Variables, Linear Mean Square Estimation. Gaussian Random Variables, Parameter Estimation: Bias and Consistency, Random Processes, Stationary Processes.

Unit II:Filtering Process

Filtering Random Processes: Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalman filter.

Unit III: Multirate Filtering

Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay's estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Unit IV: Laboratory Work

Matlab Implementation and study of Filtering Random Processes: Spectral factorization, Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalmanfilter.Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay's estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Books Recommended:

1. An introduction to statistical communication theory, David Middleton,McGraw-Hill, 1960
2. An Introduction to Statistical Communication Theory: An IEEE Press Classic Reissue. David MiddletonWiley, 08-May-1996 - Technology & Engineering- 1152 pages

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Semester - I

ELE17110DCE: Opto-Electronic Devices — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Light Sources and Detectors

Black body radiation sources of light and their spectral characteristics. Interaction of radiation with matter, photo conductivity, photo detectors and their figures of merits, PIN and APD diodes and their temperature dependence, Introduction to Solar Cells, Solar Cells, Luminescence and their uses, Optical Sources.

Unit II:Lasers

Theory of stimulated emission and optical oscillator in solid state Semiconductor, dye lasers. Laser Diode, Nonlinear optical effect. Propagation characteristics of optical fiber.

Unit III: Materials for Dielectric Waveguides

Material and wave guide dispersions. Modulation and detection of optical signals, nonlinear propagation and interaction, organic and inorganic optical wave guides, fibre amplifiers, integrated optical devices.

Unit IV: Laboratory Work

Characteristics of LED, Characteristics of LD Characteristics of PD & APD Optical Time Domain

Reflectometer(OTDR) Kerr effect Pockel's effect Spectral characteristics of LED and LD Wavelength division multiplexing of signals, Fiber-Optic System Bandwidth estimation, Single Mode Fiber Characteristics.

Books Recommended:

1. J. Wilson & J.F.B. Hawkes, "Optoelectronics – An Introduction", Prentice Hall, India, 1996.
2. P. Bhattacharya, "Semiconductor optoelectronic devices", Second Edn Pearson Education, Singapore, 2002.

Semester - I

ELE17111DCE: Data and Computer Communication **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Introduction

Introduction, Network Models, Data and Signals, Shannon's Theorem and its Applications, Composite Signals, Encoding and Modulation, Multiplexing, and Introduction to Spread Spectrum Modulation, Guided Media and Unguided Media, Switching Techniques, Circuit Switching and Packet Switching and Message Passing.

Unit II:Error Detection and Correction

Types of errors, Redundancy, Detection versus Correction, Coding, error detection, Cyclic Redundancy Check, Cyclic Code Encoder Using Polynomials, Checksum Method, Hamming Code and Linear Block Code Technique.

Unit III: Introduction to Protocol Architecture

The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data Link Control: Framing, Flow and Error Control, Introduction to DLC protocols, High-Level Data Link Control (HDLC), Point-to-Point Protocol (PPP), and Media Access Control.

Unit IV: Laboratory Work

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. B. A. Forouzan, Data Communications and Networking, TMH.
2. William Stallings, Data and Computer Communications, 10/E, Pearson.
3. P.C. Gupta – Data Communications and Computer Networks, PHI.

Semester - I

ELE17001GE: Foundations of Engineering Mathematics **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Laplace Transformation

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform.

Unit II:Fourier Series and Transformation

Fourier Series: Determination of Fourier Coefficients, Fourier Series for arbitrary period, Fourier Transforms: Properties of Fourier Transforms, , Application of Fourier Transformation.

Books Recommended:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.
4. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A.Fairley, John Wiley & Sons
5. Fourier Transformation and Laplace Transformations, Schaum Series Book ,TMHCourse

Semester - I								
ELE17002GE: Fundamentals of Signals and Systems							**Course Category: GE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to Signals and Systems Representation and Classifications of Continuous and Discrete Time Signals and Systems; Fourier Series Representation; Singularity Functions; Convolution Integral; Impulse Response and Its Properties.

Unit II:Transform Techniques

Fourier Transform and Its Properties; Laplace Transforms and its Properties, Hilbert Transform; Review of Laplace Transform; Z-Transform and Its Properties; Discrete Time Fourier Transform; Discrete Fourier Transforms.

Books Recommended:

1. Alan V, Oppenheim and A.S Wilsky, Signals and Systems, prentice Hall India
2. Simon Hykin, Signals and systems, John Wiley.
3. B. P Lathi, Signals and systems,
4. Simon hykin, Communication systems, John wiley

Semester - I								
ELE17003GE: Fundamentals of Data Communication							**Course Category: GE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction:

Data representation and flow, Analog and Digital Data, Analog and Digital Signals, Periodic Analog Signals (Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth), Digital Signals (Bit Rate, Bit Length), Digital Signal as a Composite Analog Signal, Transmission of Digital Signals, Transmission Impairment (Attenuation, Distortion, Noise), Data rate limits (Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity), Performance Parameters, Digital Transmission: Digital to Digital Conversion, analog to digital conversion, transmission modes), Analog Communication: Digital to Analog Conversion, Analog to Analog Conversion).Introduction to multiplexing and spectrum spreading.

Unit II:Error Detection and Correction:

Types of errors, Redundancy, Detection versus Correction, Coding, error detection, Cyclic Redundancy Check, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes, Hardware Implementation, checksum, Forward error correction using Hamming distance, XOR, Chunk Interleaving, etc.

Books Recommended:

1. B. A. Forouzan, Data Communications and Networking, TMH.
2. William Stallings, Data and Computer Communications, 10/E, Pearson.
3. P.C.Gupta – Data Communications and Computer Networks, PHI.

Semester - I								
ELE17004GE: Programming and Problem Solving Techniques							**Course Category: GE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction to Problem Solving Concepts

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation, Algorithms for Problem Solving - Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Evaluate a Polynomial.

Unit II: Introduction to C Programming
Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, assignment and Basic input/output statement, Conditional Statements and Loops- Relational Operators, Logical Connectives, Switch Statement, Structured Programming, Arrays, Operation on Arrays; Functions and their Applications, Standard Library of C functions and Pointer Arithmetic.

Books Recommended:

1. Deitel, “C How To Program”,
2. Byron Gottfried "Programming with C”,
3. E. Balaguruswamy, "Programming with ANSI-C",
4. Kamthane, "Programming with ANSI & Turbo C", 5. Herbert Schildt C++-The Complete Reference.

Semester - I

ELE-17001OE: Computing and Informatics - I						Course Category: OE		
Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction to Problem Solving Concepts
Computer basics. History, generations and classification of computers; Number systems; Hardware. Components of a computer input/output devices, CPU unit and memory unit, secondary storage. Software, System software, application software, compilers and translators. Operating systems. Introduction to operating systems;' types of operating systems and their functions, popular operating systems- Linux, UNIX and Windows.

Unit II:Laboratory Work:
Identification of various internal and external parts of computer system, connecting various parts of computer system, learning basic commands for file management on windows operating system, learning to create, format and print documents, spreadsheets and presentations, Internet and applications.

Books Recommended:

1. V. Srivastava “Computing and Informatics” IstEdition S. K. Kataria& Sons.
2. Chandwani “Computing and Informatics” Jain Brothers.
3. AnitalGoel “Computer Fundamentals” Pearson
4. P.K.Sinha “Computer Fundamentals” BPB Publications.

Semester - I

ELE-17002OE: Electronic Devices & Circuits - I						Course Category: OE		
Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Fundamental of Passive Components
Voltage, current, resistance, Ohm's Law, Resistor: Classification of resistors, Series and parallel connection. Colour code and application. Specifications & use. Capacitor: Capacitance & capacitive reactance. Classification of capacitors, dielectric constants, materials used, Series and parallel connection. Inductor: Inductance, self and mutual inductance, Resonance, Series and parallel connection.

Unit II: Signal Laws, Representations and Transformations
Voltage and Current sources, concept of AC/DC. Signal Waveforms, Amplitude, frequency, wavelength. Spectrum and bandwidth. Networks and circuits, Kirchhoff's current law (KCL) and Kirchhoff s voltage law (KVL), Instantaneous values, R.M.S. values, phase-cycle. Transformers, step-up and step down, turns ratio and wire guages, efficiency. Concept of generators & motors.

Lab Work:

- Resistance calculation using color code.
- Ohms Law, KCL and KVL.
- Series and Parallel combination of Resistors and capacitors.
- Measurement Time period, Frequency and RMS value and Average value of a sinusoid.
- Current, voltage and resistance measurement using multimeter.

- Analytical study of step-up and step-down transformers

Books Recommended:

1. Del Torro, "Electrical Engineering Fundamentals", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2. W.H. Hayt and J.E. Kemmerly, "Engineering Circuit Analysis," Mc-Graw Hill Delhi (1996).

Semester - II

ELE17201C: Analog Communication Systems **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Amplitude Modulation and Demodulation

Introduction to Signals and its classification**,** Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of Amplitude Modulation, Double Side band Suppressed Carrier, (DSB- SC) System, Generation and Demodulation of DSB- SC signals, Advantages of SSB transmission, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and reception.

Unit II: FM Modulation, Reception and Noise

Concept of Angle Modulation: Mathematical theory, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission. FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, FM Detector using PLL, Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Unit III: Laboratory Work

Study of ICs (AD633/AD734), Design and realize AM modulator using Square Law modulator and calculate its modulation index and power, design and realize AM detector using Square Law detector and Envelope detector, design and realize DSB-SC signal Modulator using Analog Multiplier, design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop, Simulation of SSB-SC modulator and demodulator using MATLAB/Simulink, Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink.Derivation of modulation index in case of FM signal, to design and realize FM generation and Detection, To study & realize Op-amp based Pre-Emphasis & De-Emphasis circuits.**Field study/visit to place such as Radio Kashmir Srinagar.**

Books Recommended:

1. Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.
2. George Kennedy, "Electronic Communication System", McGraw- Hill.
3. Gary M. Miller and Jeffery S. Beasley, "Modern Electronic Communications ", PHI.
4. Simon Haykin, "Communication Systems", 8th edition, Wiley Publishers.
5. Wayne Tomasi, "Electronics Communication systems", 4th edition, Pearson Publishers.

Semester - II

ELE17202C: Microprocessor Architecture and Programming **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Architecture, Addressing Modes, Instruction Set and ALP

Introduction to Microprocessors, 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU and EU, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor based systems. Introduction to Programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions.

Unit II:Interrupts, Timing and Peripheral Devices

Introduction to procedures, interrupts and interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts, Software Interrupts, Hardware Interrupts, Multiple Interrupts, ALP using interrupts, 8259 Programmable Interrupt Controller-Features, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum and Maximum Mode 8086 System, Peripheral Devices and Interfacing, Introduction to memory and its types, Memory interfacing, Memory mapped and I/O Mapped Schemes, Even and Odd Addressing. Data Transfer Schemes, I/O Interfacing, Isolated and Memory Mapped I/O instructions, Ports. Study of frequently used Peripheral chips.

Unit III: Laboratory Work

The Laboratory work shall be based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Introduction to 8086, 80186, 80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company.
2. Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company.
3. Microprocessor and x86 Programming, V. R. Venugopal, McGraw Hill Publishing Company.
4. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by W. A. Treibel and Avtar Singh, Prentice Hall.
5. Microprocessors and Interfacing Programming and Hardware, D. Hall, TMG.
6. Microprocessor 8086 Architecture, Programming and interfacing by Sunil Mathur. PHI.

Semester - II

ELE17203C: Power Electronic Circuits and Systems — **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Introduction to Power Devices and Converters

Review of switching characteristics of Power diodes, BJT's), Characteristics of an ideal switch, Types of electronic switches. Thyristor construction and characteristics, Methods of turning ON, Turn-off, effect of high di/dt and dv/dt, Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC , Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit II:Regulators, Inverters and Cyclo-converters

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Half-Bridge converter and Full Bridge converter. Inverter: Principle of operation, performance parameters, Pulse width modulation techniques,

Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down, design of single-phase step down Cycloconverters, Power supplies: SMPS, UPS.

Unit III: Laboratory Work

Verify switching action of a Power BJT and MOSFET, IV characteristics of SCR, DIAC, TRIAC and UJT. Calculation of Holding and latching currents of SCR, To study various Commutation Techniques, Design of BUCK, BOOST and BUCK-BOOST converter.

Books Recommended:

1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.
3. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.
4. Introduction to Thyristors and their Applications, by M. Ramamorty .

Semester - II

ELE17204C: Microwave Engineering **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Microwave Transmission Lines and Wave Guides

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Standing wave and Standing wave ratio, Fundamentals of Microwave Waveguides, Rectangular Waveguides, TE & TM modes in Rectangular magnitudes, S- Matrix.

Unit II:Microwave Devices

Microwave tubes, Klystrons: Multi-cavity Klystron and Reflex Klystron, Gunn Oscillator, Introduction to the Strip Lines: Micro Strip and Parallel Lines.

Unit III: Laboratory Work

Study of different Microwave guide components, determination the frequency and wavelength in a rectangular wave guide working on TE 10 mode, Finding the standing wave ratio and reflection coefficient. Measurement of an unknown impedance with smith chart, VI characteristics of Gunn diode, O/P power and frequency as a function of voltage in case of Gunn diode, Magic tee, Characteristics of Klystron tube and determination of its electronic tuning range, various experiments using CST Tool.

Books Recommended:

1. Microwave Devices and circuits by Samuel Y. Liao
2. Microwave Principles By Herbert J. Reich
3. Foundations for Microwave engineering by Robert E. Collin
4. Elements of Engineering Electromagnetics by NannapaneniNarayanaRao
5. Electromagnetic Field theory by RishabhAnand

Semester - II

ELE17205DCE: VLSI Technology **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
4	0	0	4	25	25	50	NA	100

Unit I: Crystal Growth and Epitaxy

Crystal Growth and Wafer Preparation, Electronic grade Germanium and Silicon, Zone melting process of purification, Simple purification process, Czhrolaski method. Epitaxy, Vapor phase epitaxy, Transport process and Reaction kinetics, Molecular beam Epitaxy process.

Unit II:Diffusion Technology

Fick's one-dimensional diffusion equation. Diffused layers, Pre-deposition step, Drive-in diffusion with expression, Field aided diffusion, Diffusion system, C-V technique for profile measurement, Junction depth and sheet resistance measurement.

Unit III: Oxidation and Lithography

Oxidation Techniques, Growth mechanism and Kinetics of Oxidation layers, Oxidation techniques and Systems. Lithography, Lithography process and Types of Lithography, Optical Lithography, Contact proximity and projection Lithography techniques, Resists, Electron beam Lithography, Electron Resists.

Unit IV: Etching, Metallization and IC Fabrication

Etching, Subtractive and Additive method of pattern transfer, Resolution and edge profiles in Subtractive pattern transfer, Selectivity and feature size control of an etching process. Contacts (Ohmic and rectifying), Physical vapor deposition, Methods of physical vapor deposition, Resistance heated evaporation, Electron beam evaporation, Thickness measurement and monitoring. Basic consideration for IC processing and Packaging, Modern IC fabrication.

Books Recommended:

1. S. M. Sze, VLSI Technology, Mcgraw Hill Publishing Company.
2. Azeroff and Brophy, Electronic Processes in Semiconductors, McGraw Hill Publishing company.
3. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.
4. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.

Semester - II								
ELE17206DCE: CMOS VLSI and Nano-Electronics –II (Digital IC Design)							**Course Category: DCE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to CMOS and Combinational Logic Design

Digital IC, Digital Combinational and sequential circuit, issue in digital IC design, Quality, metrics of Digital Design, Review of CMOS.Static C-MOS Inverter and its characteristics, CMOS Design Consideration Transistor Sizing, Power Dissipation, Design Margining, Ratioed Logic, Pass Transistor Logic.

Unit II:Dynamic CMOS design and Sequential Logic Design

Dynamic CMOS design, basic principle, speeds and power Dissipation of Dynamic Logic, Signal Integrity in Dynamic Design, Cascaded Dynamic.Static Latches and registrars, Dynamic Latches and Registers, Alternative Register Styles, Pipelining..

Unit III: Memory Design and Implementation Strategies for Digital ICS

Memory Classification, Memory Architecture and Building Block, Read only Memories, Nonvolatile Read Write Memories, Read-Write Memories, Memory Peripheral Circuit Custom, Semi-custom Circuit Design, Cell–Based Design Methodology, Array Based Implementation Approach**,** Layout Introduction to PLA, PAL, CPLD,FPGA.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals on Digital design including combinational (Static and Dynamic) and sequential circuits, Memory and Programmable logic devices.

Books Recommended:

1. J. M. Rabaey, A. Chandrakasan and B. Nikolic: Digital Integrated Circuits- A Design Perspective, 2nd ed., PHI, 2003
2. D. A. Pucknell and K. Eshraghian, Basic VLSI Design, PHI, 1995
3. N.H.E. Weste and K. Eshraghian, Principles of CMOS VLSI Design - a System Perspective, 2nd ed., Pearson Education Asia, 2002
4. S.M. Kang and Y. Leblevici, CMOS Digital Integrated Circuits Analysis and Design, 3rd ed., McGraw Hill, 2003
5. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia) Pte Ltd, 2002

R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 1997

Semester - II								
ELE17207DCE: Optical Communication and Networks							**Course Category: DCE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Optical Fibres and Links

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED's and lasers, Point to point links, power links, error control, coherent detection, differential quadrature phase shift keying (QPSK).

Unit II: WDM

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, WDM examples.

Unit III: Optical Networks

Passive Optical Networks, IP over DWDM, Optical Ethernet Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit

Unit IV: Laboratory Work

To perform various experiments using OFC training kit, Multiplexing, Point-to- point links, System considerations, Overall fiber dispersion in Multi-mode and Single mode fibers, Transmission distance, Line coding in Optical links, Measurement of Attenuation and Dispersion, Eye pattern.

Books Recommended:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Semester - II								
ELE17208DCE: Design and Analysis of Active Filters								**Course Category: DCE**
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Filter Approximation Models and Sensitivity Analysis

Introduction to Analog filter theory, filter approximations, Butterworth approximation, Chebyshev approximation, Bessel filters, frequency transformations, lowpass-lowpass, lowpass- highpass, lowpass-bandpass and low-pass - band reject transformations.

Unit II:Operational Transconductance Amplifiers, Sensitivity and Active filter Synthesis

Operational Transconductance Amplifier (OTA), Circuit Descriptions of OTA, Advantages, limitations. Elementary Transconductor Building Blocks: Resistor, Integrator, Amplifier, summers, gyrators and Modulators. First and Second order Filters, High-order filters, Sensitivity study, Sensitivity function, magnitude and pass sensitivities, single parameter sensitivity, multiple parameter sensitivity. Cascade approach, Simulated Inductance Approach, Operational Simulation of LC ladders and FDNR approach. Immitance converters and inverters, Generalized Impedance converter.

Unit III: Switched Capacitor filters

The MOS switch, The Switched capacitor/resistor equivalence, analysis of switched capacitor filter using charge conservation equations, First-order building blocks (Inverting and Non-inverting Amplifier, Integrator and Differentiator), Sampled-Data operation, Switched capacitor First and Second order Filters, Switched capacitor High-order filters.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals on filter synthesis, operational transconductance amplifier and switched capacitor filters.

Books Recommended:

1. Kendall Su, Analog Filters, Second Edition, Kluwer Academic Publishers, 2002
2. Larry D. Paarmann, Design and Analysis of Analog Filters: A Signal Processing Perspective, Kluwer Academic Publishers, 2003.
3. M. E. van Valkenburg and Rolf Schumann, Analog Filter Design, Oxford University Press, 2005.
4. Mingliang Liu, Demystifying Switched-Capacitor Circuits, Newnes, Elsevier, 2006.

Semester - II								
ELE17209DCE: Simulation and Modeling using MATLAB								**Course Category: DCE**
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to MATLAB

Introduction, MATLAB Windows, Types of Files, Constants, Variables and Expressions; Character Set, Data Types, Operators, Built-in Functions, Vectors and Matrices; Matrix Manipulations, Matrix and Array Operations, Control Structures; Loops and Branch Control Structures.

Unit II:MATLAB Editor and MATLAB Graphics

MATLAB Editor, Creating M-Files, Function Subprograms, Types of Functions, Function Handlers, Errors and Warnings, MATLAB Debugger, Two- Dimensional Plots, Multiple Plots, Subplots, Specialized Two-Dimensional Plots, Three-Dimensional Plots

Unit III: Data and Image Visualization in MATLAB
Understanding Color maps, Using Color to Describe a Fourth Dimension, Image Data Matrices, Image Formats, Image Files, Image Utilities, Reading and Displaying Image, Image Compression, Image Denoising, Image Filtering, Introduction to Movies and Sound in MATLAB.

Unit IV: Simulink Basics
Starting Simulink, Simulink Modeling, Solvers, Data Import/Export, State-Space Modeling and Simulation, Simulation of Non-Linear Systems, Creating a random bit stream System objects and their benefits, Modulating a bit stream using Digital Modulation Techniques, Applying pulse-shaping to the transmitted signal, Modeling a QPSK receiver for a noiseless channel, Computing bit error rate.

A minimum of 20 programs to be simulated on MATLAB software across all the four units.

Books Recommended:
1. P.A. Rajammal, *"A handbook of Methodology of Research",*Vidyalaya Press, 1976.
2. BuaneHanselman, Bruce Littlefield, *"Mastering MATLAB 7",* Pearson, 2013
3. Agam Kumar Tyagi, *"MATLAB and Simulink for engineers",* 2nd Edition, 2012.
4. Raj Kumar Bansal, *"MATLAB and its Applications in Engineering"*, Pearson, 2009.

Semester - II

ELE17210DCE: Wireless Adhoc and Sensor Networks — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Introduction
Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards. Wireless LAN (Infrared Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11: System Architecture, Protocol Architecture, 802.11b, 802.11a)

Unit II:Ad Hoc Wireless Networks (Transport Protocols and Security)
Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless Internet, MAC protocols, Issues in Designing a MAC Protocol for Ad hoc Wireless Networks, Design Goals for a MAC Protocol for Ad hoc Wireless Networks, TCP over Ad hoc Wireless Networks, Classifications of the MAC Protocols, Other MAC Protocols. Routing Protocols, Issues in Designing a Routing Protocol for Ad hoc Wireless Networks, Classifications of Routing Protocols. Secure Routing in Ad hoc Wireless Networks

Unit III: Sensor Networks
Basics of Wireless, Sensors and their Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs. Sensor Network Hardware: Components of Sensor Mote, Operating System in Sensors– TinyOS, LA-TinyOS, SOS, RETOS Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor network extension, TOSSIM.

Unit IV: Laboratory Work
The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:
1. Adhoc Wireless Networks – Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education.
2. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press.
3. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group.
4. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers.
5. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group.

Semester - II

ELE17211DCE: Communication Hardware Design **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Design of High Frequency Amplifier and Oscillators

Review of Noise in Electronic Networks; Network Noise Representation, Broad Banding Techniques - Input Compensation, Feedback, Lossless Feed-back Amplifiers, Neutralization, Cascode Amplifiers; Theory of Automatic Gain Control; AGC System Components; Design Examples; High Frequency Oscillator Circuits; Amplitude and Phase Stability; Parallel Mode and Series Mode Crystal Oscillators; Voltage Control Oscillators; Design Examples.

Unit II:Phase Locked Loop (PLL) and Their Applications

Introduction; Linear Model of the Phase Locked Loop, Phase Detectors, VCOs and Loop Filters Design Examples and Applications; Tracking Filters; Angle Modulation: Frequency Demodulation, Amplitude Demodulation; Phase Shifters; Signal Synchronizers; Costas Loop; Digital Phase Lock Loop.

Unit III: Frequency Synthesizers

Introduction; Direct Frequency Synthesis; Frequency Synthesis by Phase Lock; Effect of Reference Frequency on Loop Performance; Variable Modules Dividers; Methods for Reducing Switching Time; Direct Digital Synthesis; Synthesizer Design Examples; Output Noise Considerations.

Unit IV: Mixers, High Efficiency Amplifiers

Frequency Mixers; Switching Type; Mixers and Their Performance; Square Law Mixers; BJT and FET Mixers; Balanced Modulator ICs, Class C Power Amplifier Design; Frequency Multiplication; Class D, E and S Amplifiers; Modulators and Amplifiers Using Vacuum Tubes and Power Electronic Devices.

To perform at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. J. Smith, Modern Communication Circuits, McGraw Hill Book, 1996.
2. D. Roddy& J. Coolan, Electronic Communication, Prentice Hall of India, New Delhi, 1987.
3. Sidney Soclof, Applications of Analog ICs, Prentice Hall of India, New Delhi, 1990.

Semester - II

ELE17005GE: Optical Fiber Communication **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Optical Fibers and Links

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED's and lasers.

Unit II:WDM and Optical Networks

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, network topologies, WDM examples. Passive Optical Networks, IP over DWDM, Optical Ethernet Optical receiver operation- Fundamental receiver operation.

Books Recommended:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Semester - II

ELE17006GE: System Simulation using MATLAB **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction to MATLAB

Introduction, MATLAB Windows, Types of Files, Constants, Variables and Expressions; Character Set, Data Types, Operators, Built-in Functions, Vectors and Matrices; Matrix Manipulations, Matrixand Array Operations, Control Structures; Loops and Branch Control Structures, MATLAB Editor, Creating M-Files, Function, Subprograms, Types of Functions, Two- Dimensional Plots, MultiplePlots, Subplots, Specialized Two-Dimensional Plots, Three-Dimensional Plots.

Unit II: Data and Image Visualization in MATLAB

Image Data Matrices, Image Formats, Image Files, Image Utilities, Reading and Displaying Image, Image Compression, Image De-noising, Image Filtering, Introduction to Simulink: Starting Simulink, Simulink Modeling, Solvers, Data Import/Export, State-Space Modeling and Simulation.

Books Recommended:

1. P.A. Rajammal, "A handbook of Methodology of Research", Vidyalaya Press, 1976.
2. BuaneHanselman, Bruce Littlefield, "Mastering MATLAB 7", Pearson, 2013
3. Agam Kumar Tyagi, "MATLAB and Simulink for engineers", 2nd Edition, 2012.
4. Raj Kumar Bansal, "MATLAB and its Applications in Engineering", Pearson, 2009.

Semester - II

ELE17007GE:Data Structures **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Lists, Stacks and Queues

Lists, Abstract Data Type-List, Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked - Implementation and Applications. Stacks, Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Applications. Queues Abstract Data Type-Queue, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of DEQUEUE, Array Implementation of a de-queue, Linked List Implementation of a de-queuer.

Unit II: Searching, Sorting and Advanced Data Structures

Linear Search, Binary Search, Applications. Internal Sorting, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sot, Heap Sort, Sorting on Several Keys.

Books Recommended:

1. Tenenbaum, Data Structures through C
2. Weiss, Data Structures and Algorithms in C++
3. SamiranChattopadhy, Data Structures through C Language
4. Patel, Data Structures with C
5. Wiener and Pinson, Fundamentals of OOPS and Data Structures in Java

Semester - II

ELE17008GE: Wireless Sensor Networks **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction to Adhoc Wireless Networks

Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards.

Wireless LAN (Infrared vs radio transmission, Infrastructure and Ad-hoc Network, Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless Internet, MAC protocols, Issues in Designing a MAC Protocol for Ad hoc Wireless Networks.

Unit II: Sensor Networks

Basics of Wireless, Sensors and their Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs. Sensor Network Hardware: Components of Sensor Mote, Operating System in Sensors– TinyOS, LA-TinyOS, SOS, RETOS.

Books Recommended:

1. Adhoc Wireless Networks – Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education.
2. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press.
3. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group.
4. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers.

Semester - II

ELE17003OE: Computing and Informatics -II — **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to office automation tools (MSWord, PowerPoint, Excel), Create and edit the document, profiling tools, formatting documents, using templates, wizards and charts and objects, custom styles and pagination. Spreadsheet creation, addressing, formula editing, sorting and filtering, toolbars. Introduction to PowerPoint presentation, templates, layouts and formatting.

Unit II:Laboratory Work

Working with Documents, Formatting Documents, Setting Page style, Creating Tables, Mail merge, Templates. Working with spreadsheets, formatting, insertion, deletion and organization of worksheets. Creating a presentation, formatting a Presentation, Adding Effects to the Presentation, Printing Handouts.

Books Recommended:

1. Archana Kumar "Computer Basics with Office Automation" 1st Edition I. K. International Publishing House.
2. RohitKhurana "Learning Ms-Word and Ms-Excel" APH Publishing Corporation.
3. AnitalGoel"Computer Fundamentals" Pearson.

Semester - II

ELE17004OE: Electronic Devices & Circuits-II — **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Measuring Instruments and Power Supply

Measurement: Meter, Ammeter, Voltmeter, Ohmmeter, Multimeter, Introduction to Cathode Ray Oscilloscope (CRO) and Function Generator.

Power supply. AC/DC Voltage/Current, Unregulated and regulated power supplies, introduction to IC based regulated power supplies. Study of 78XX and 79 XX series. SMPS Power Supply, DC/AC Inverters, working principle. UPS. Typical Public Address system.

Unit II: Transducers

Transducer: Sensors and actuators; Properties of a sensor; Resistive, capacitive and inductive sensors, Pressure Sensor; Temperature Sensor; Photo Sensor; Humidity Sensor, Gas Sensor; Applications of sensors.

Lab Work:

- Amplitude, Time period, frequency, phase measurements using CRO.
- Testing the characteristics of resistor, capacitor, inductor, diode on CRO.
- Testing of 7805/12/15 IC
- Testing of 7905/12/15 IC
- Testing of Temperature sensor.
- Testing of Photo sensor.

Books Recommended:

1. Instrumentation and Measurements by A. K. Sawhney
2. Electronic Instrumentation by Bell.

Semester - III

ELE17301C: Physics of Semiconductor Devices **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	50	NA	75

Unit I: Crystal Structure and Carrier Transport

Crystal Structure, Space lattices, Primitive and Unit Cell, Index system for crystal planes, Separation between the parallel planes of a cubic crystal, Description of Schrodinger wave equation and its application to free space and Potential well, Physical interpretation of wave function, Kroning Penney Model, K-space diagramEffective mass, Concept of Hole, Derivation of Density of state functions, Fermi-Dirac Distribution function, Carrier concentration at thermal equilibrium, Carrier transport Equation, Decay of photo excited carriers, carrier lifetime, Hall effect.

Unit II:Semiconductor and BJT's

Abrupt and Graded PN junction, Current- voltage characteristics of PN junction, Depletion Capacitance, Diffusion capacitance, Junction breakdown phenomenon, Schottky effect, Bipolar junction transistors, current gain parameters, minority carrier distribution and terminal currents, Eber-Moll model.

Unit III: Field Effect Transistors, Microwave and Opto Electronic Devices

Field effect transistors, JFET and MOSFET- Basic device characteristics with analysis, MOS Capacitors, MOSFET Types- Basic device Characteristics with analysis, Equivalent Circuit. IMPATT: Static and Dynamic Characteristics, Gun diode and its Modes of operation, P -N Junction Solar Cells, V-I Characteristics, Ideal Conversion efficiency.

Books Recommended:

1. Donald E. Neaman, Semiconductor Physics and Devices, Basic Principles, McGrawHill Publishing, 3rd Edition, 2003.
2. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.
3. S. M. Sze, Physics of Semiconductor Devices, Wiley eastern Ltd.
4. AzeroffandBrophy, Electronic Processes in Semiconductors, McGraw Hill Publishing Company.
5. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.

Semester - III

ELE17302C: Control System Engineering **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Control Systems , System Representation and Time Domain Analysis

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods,Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit II:Stability and Frequency Analysis

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, Stability : Conditional an absolute stable systems, location of poles and stability, Routh-Hurwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit III: Laboratory Work

Time domain analysis of 1st and 2nd order system (Impulse and Step Response), Design of PI, PD and PID controllers, Root Locus Plot, Polar Plot, Study of Gain Margin and Phase Margin using MATLAB.

Books Recommended:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw HillInternational
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

Semester - III

ELE17303C: Digital Signal Processing — **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Discrete Time Signals and Systems, DFT

Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIRsystems, IIR systems, Recursive Systems, Non- recursive Systems, Correlation: Cross- Correlation and Auto- Correlation, Properties, A/D Conversion Process: Sampling, Frequency Relationships, Aliasing, Quantization, Encoding, Anti-Aliasing Filter. Fourier Series and Fourier Transform, Introduction, Frequency Domain Sampling, Properties of DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT algorithms, Properties of WN, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms

Unit II:Digital Filter Design and Introduction to Z –Transform

Frequency response for rational system functions, All pass minimum phase functions; Basic structures for IIR systems: Design of IIR from continuous time filters, Frequency transformation of IIR low pass filters,Linear systems with generalized linear phase; Basic network structures for FIR filters; Design of FIR filters; window functions. Frequency sampling technique. Comparison of FIR and IIR filters, Z transform and its Properties.

Unit III: Laboratory Work

Introduction to digital signal processing toolbox (MATLAB). Commonly used DSP based commands in MATLAB, Computation of Correlation and convolution of various sequences using MATLAB. DFT computation, Optimal order FIR filter design in MATLAB. Performance analysis of various windowing techniques for a given set of specifications using MATLAB.

Books Recommended:

1. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
2. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
3. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

Semester - III

ELE17304C: Computer Networks — **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	2	3	25	NA	25	25	75

Unit I: Introduction to Computer Networks and Protocols

Introduction to computer networks, history and development of computer networks, network topologies, network architecture, network protocols and standards, network models, layered architecture, OSI model, TCP/IP model, guided and unguided media, errors in transmission, Encoding techniques, CSMA, CSMA/CD, CSMA/CA protocols. Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols, switching (circuit and packet switching).

Unit II:NetworkLayer and Transport Layer

(IPv4 & IPv6), ARP, DHCP, ICMP, IGMP, Routing algorithms (unicast, multicast) Distance vector, Link state, Metrics, addressing techniques: address Classless (class A, class B, class C), CIDR, Subnetting and supernetting, Network Address Translation. Transport and Application Layer Transport layer: Process to process delivery, user datagram protocol (UDP), transmission control protocol (TCP). Connection establishment and termination, flow and congestion control, timers, retransmission, TCP extensions, etc. Quality of services, Introduction to Network Security.

Unit III: Laboratory Work

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2006:
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003:
3. Andrew S Tanenbaum, DJ Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.
4. LL Peterson, BS Davie, Computer Networks: A Systems Approach, 5th Ed., Morgan-Kauffman, 2011.
5. W Stallings, Cryptography and Network Security, Principles and Practice, 5th Ed., Prentice- Hall, 2010

Semester - III

ELE17305DCE: Microcontroller Architecture and Programming — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Architecture and Instruction Set

Microcontroller versus General-purpose Microprocessors, Microcontrollers for embedded systems,Embedded applications, choosing a Microcontroller. Architecture of Atmel AT89C51Microcontroller, input/output pins, ports and circuits, external memory, counter and timer, serial data input and output, interrupt,Addressing Modes and Instruction Set.

Unit II:Serial Communication and Interrupts Programming

Timer / Counter programming: programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication programming: Basics of serial communication, 8051connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of8051; programming timer interrupts, programming external hardware interrupts, and programming serialcommunication interrupts.

Unit III: Interfacing and PIC Microcontrollers

Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing steppermotor.Introduction to PIC series of Microcontrollers. Architecture and programming of 8-bit and 16-bitPIC microcontrollers.

Unit IV: Laboratory Work

The Laboratory work shall include 10 Practicals based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Muhammad Ali Mazidi, J. GillispieMazidi,The 8051 Microcontroller & Embedded Systems, Prentice Hall 2000.
2. Kenneth J. Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.
3. MykePredko, Programming and Customizing the PIC Microcontroller.
4. Fernando E. Valdes-Perez, Ramon Pallas-Areny, Microcontrollers: Fundamentals and Applications with PI.

Semester - III								
ELE17306DCE: CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design)						**Course Category: DCE**		
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Analog CMOS Sub-circuits

MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources, Translinear Circuits: Ideal Translinear Element, Translinear-loop-circuit synthesis, Various Translinear circuits, Squarer/divider, Squarer rooting, Current Mirrors, The Basic Current Mirror, Cascoding the Current Mirror, Biasing Circuits Amplifiers, Gate-Drain Connected Loads, Current Source Loads, Common-Source Amplifier, The Cascode Amplifier, The Common-Gate Amplifier, The Source Follower (Common-Drain Amplifier), The Push-Pull Amplifier, Differential Amplifiers.

Unit II:References, Multistage Amplifiers and Nonlinear Circuits

Voltage and Current References, MOSFET-Resistor Voltage References, Parasitic Diode-Based References, Bandgap Reference Design, Operational Amplifiers, The Two-Stage Op-Amp, The Operational Transconductance Amplifier (OTA), Basic CMOS Comparator Design, MOS Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, Modulation and Demodulation using Analog Multipliers

Unit III: Data Converters

Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals on Digital design including combinational (Static and Dynamic) and sequential circuits, Memory and Programmable logic devices

Books Recommended:

1. P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, Analysis and Design of analog integrated circuits, John Wiley and Sons, 2001.
2. R. Jacob Baker, CMOS, Circuit Design, Layout, and Simulation, JOHN WILEY & SONS, 2010.

Semester - III								
ELE17307DCE: Digital System Design using HDL						**Course Category: DCE**		
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Hardware Description Languages and VHDL

Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioural, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes:Assignment, Logical, Arithmetic, Relational and concatenation operators.

Unit II:Concurrent, Sequential Codes and State Machines

Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, PROCESS, IF, ELSIF, WAIT, CASE,LOOP, Signal versus Variable, Bad Clocking, Brief concepts of Finite State Machines,(Melay and Moore Machines), state diagrams and state tables.

Unit III: Combinational and Sequential Circuit Design

Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators,Boolean functions using Multiplexer. Shannon's expansion theorem, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UPDOWN, Johnson and Ring Counters, Familiarity with Quartus Altera/ Xilinx ISE Suite. Combinational systems Implementation: Adder, Subtractor MUX, DEMUX, Encoder, Decoder and Comparator etc. Sequential system Implementation: Flip Flop, Shift registers, ALUand LFSR.

Unit IV: Laboratory Work

Familiarity with Quartus Altera/ Xilinx ISE Suite. Combinational systems Implementation: Adder, Subtractor MUX, DEMUX, Encoder, Decoder and Comparator etc. Sequential system Implementation: Flip Flop, Shift registers, ALU, LFSR.

Books Recommended:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
4. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design,TMH2008.

Semester - III								
ELE17308DCE: Speech and Audio Processing							**Course Category: DCE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Fundamentals of Speech and Prediction

The human speech production mechanism, LTI model for speech production, nature of the speech signal, linear time varying model, types of speech, voiced and unvoiced decision making, Lattice structure realization, forward linear prediction, auto correlation covariance method, uniform and non-uniform quantization of speech,waveform coding of speech,the .726 standarad for ADPCM.

Unit II:Speech Synthesis

History of text- to- speech system, synthesizer technologies, HMM based speech synthesis, sine wave synthesis, speech transformation, emotion recognition from speech, watermarking for authentication of a speech/ Music signal, digital watermarking, watermarking in capestral domain.

Unit III: Speech Processing Applications

Speech Recognition systems, Architecture of a Large Vocabulary Continuous Speech Recognition System, Deterministic Sequence Recognition for ASR, Statistical Sequence Recognition for ASR, VQHMM based speech recognition. Speech Enhancement, Adaptive Echo Cancellation.

Unit IV: Laboratory Work

To simulate speech processing model using Matlab, Speech recognition systems implementation Acoustic analysis, linear time warping, dynamic time warping (DTW), Statistical Sequence Recognition for ASR:Bayes rule, Hidden Morkov Model (HMM), VQ- HMM based speech recognition. Speech watermarkingusing Discrete cosine Transform (DCT), Discrete Wavelet Transform.

Books Recommended:

1. Speech and Audio Processing, Dr.Shaila D. Apte, Wiley Publications
2. Digital Signal Processing, Dr.Shaila D. Apte, Wiley Publications
3. Theory and Applications of Signal Processing, L. R. Rabiner and B. Gold, Prentice Hall 1985
4. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
5. Introduction to Digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall

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Semester - III								
ELE17309DCE: Advanced Communication Systems							**Course Category: DCE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
3	0	2	4	25	NA	50	25	100

Unit I: Modern Radar System and Satellites

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, PRF, Un-ambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter, Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations.

Unit II:Telecommunication Switching Techniques

Time division switching: Time switching, space switching, Three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlangformula and signalling.

Unit III: Multiple Access Techniques

Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, EstimatingChannel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT.

Unit IV: Laboratory Work:

To develop a simple switching model using Matlab, to study various multiplexing techniques usedtelecommunication networking, to study stored program based space division switch, to under fading insatellite communication using wireless communication link, to verify radar equation in Matlab.

Books Recommended:

1. J.G. Proakis, "Digital Communication", MGH 4TH edition.
2. Edward. A. Lee and David. G. Messerschmitt, "Digital Communication", Allied Publishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, "Digital Communication Techniques", PHI.

Semester - III

ELE17310DCE: RF Engineering — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: RF Passive Components and Transmission Line Analysis

High frequency Resistors, Capacitors and Inductors – Transmission Line Analysis line equation –Microstripe line – SWR voltage reflection co-efficient propagation constant, phase constant, phase velocity –smith chart – parallel RL and RC circuits ABCD parameters and S parameters.

Unit II:RF Circuits Design

RF Oscillator Design, Fixed frequency oscillator – Dielectric resonant oscillator, Voltage controlled oscillator- sun element oscillator – RF mixer design – single ended mixer – double ended mixer – RF filter resonator and filter configuration – Butterworth and chebyshev filters – Design of micro stripe filters.

Unit III: Communication Circuits

Integrated Circuit Requirements for Modern RF/Wireless System; RF Circuits – Low-Noise Amplifier (LNA) and Power Amplifier (PA); Oscillators; Mixers; Modulators and Demodulators; Integration Issues of RF and Baseband Circuits

Unit IV: RF System Design and Lab Work

Link design – Fading design – Protected and non-protected microwave systems – Path calculation Spread spectrum microwave system – Compatibility – Safety co-ordinate systems – Datam"s& GPS Receiver design receiver architecture dynamic range – frequency conversion and filtering examples of practical receivers FM broadcast, Digital cellular, Multimeter wave point to point,Direct conversion GSM receiver-RF MEMS: Concept, Implementation and Applications, Hands on training using Network optimization and planning tool. Field visit at any Cell site, Study ofvarious physical and logical channels in GSM system. Study of tilting of antenna system in GSM.

Books Recommended:

1. Reinhold Ludwig and PavelBretchko, "RF circuit design," Pearson Education, 2007.
2. David Pozar, "Microwave and RF design of Wireless systems," Johnwiley, 2008.
3. Josn Rogers and Calvin Plett, "Radio frequency Integrated circuit design," Artech house, 2002.
4. FerriLosee, "RF systems, Components and Circuits handbook," Artech house, 2002.
5. Joseph.J.Carr, "Secrets of RF circuit design," Tata McGraw Hill, 2004.
6. VivekVaradhan," RF MEMS and their applications", Wiley Eastern edition, 2003.

Semester - III

ELE17311DCE: Soft Computing and Neural Networks — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	25	50	NA	100

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of FuzzySets, Fuzzy

Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle forFuzzy Sets, Concept and models of Fuzzy logic Circuits-viz. AND, OR and NOT.

Unit II:Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, Probability vs.possibilities, Approximate reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decompositionof compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rulebased models.

Unit III: Introduction to Neural Networks

Biological and Artificial Neurones, Neuron Models: Classification and Linear Separability, X-OR Problem, Hopfield Networks, Overview of Neural Networks Architectures: Multi-layered Feed forward and Recurrent Networks, Learning: Supervised, Unsupervised and Reinforcement, Learning Laws. Backpropagation (BP) Networks, Generalized delta rule, BP Training Algorithm and Derivation for Adaptation of Weights.

Unit IV: Programming

Implement fuzzy set operation and properties; verify various laws associated with fuzzy set; Demonstration of Mamdani and TSK rule based system using fuzzy logic tool box; Implement basic logic functions using Adaline and Madaline with bipolar inputs and outputs; implement composition of fuzzy and crisp relations; Implement discrete Hopfield network and test for input pattern; implement back propagation network for a given input pattern;

Books Recommended:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klirabd B. Yuan, Printice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, Printice Hall of India
3. Neura;l Networks in Computer Intellligence, Limin Fu, Mcgraw Hill International
4. Adaptive Recognition and Neural Networks, Yoh-Han Pao, Addison Weseley
5. Introduction to the Theory of Neural Computations, John Hertz, Anders Krogh,Addison Wesley.

Semester - III

ELE17312DCE: Cryptography and Information Security **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Fundamentals of Information Security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers, additive and multiplicative ciphers, Data scrambling and descrambling Cryptanalysis of classical ciphers. Introduction to modular arithmetic. Differential and linear cryptanalysis.

Unit II:Cryptographic Algorithms

Introduction to Data encryption standard, Security of DES, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Geffe generator, Stop and Go generator.

Unit III: Information Hiding for covert communications

Need of information hiding, Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains. Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Unit IV: Laboratory Work

The laboratory work shall be based on unit I through unit III and shall use hardware study as well as experiments using simulations (at least 10 Practicals to be conducted).

Books Recommended:

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", PrenticeHall, New Jersey, 1999.
2. B. Schneier , "Applied Cryptography", John Willey & Sons, Inc., 2nd edition, 1996.
3. Lu, S.: Multimedia security: Stenography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Semester - III

ELE17313DCE: Advanced Microprocessors **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Intel 8086, 80186 and 80286 Processors

Architecture and working of 8086 and 80186 Microprocessor, Register set of 8086 and 80186 Microprocessor, Addressing Modes and memory segmentation in 8086 and 80186 microprocessor, Differences between 8086 and 80186 microprocessors. Intel 80286 Microprocessor, 80286 Architecture, system connection – Real and Protected mode operations.

Unit II:Advanced Intel Processors

Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection, 80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode, Recent trends in microprocessor design. Pentium –super scalar architecture.

Unit III: Advanced and Special Purpose Processors

Architecture, addressing and programming of Digital Signal Processors, co-processors and I/Oprocessors. Difference between CISC and RISC processors, various emerging trends in MicroprocessorDesign. Introduction to graphics and other special purpose processors, Introduction to architecture ofmulti-core processors.

Unit IV: Laboratory Work

The Laboratory work shall be based on units I through IV. The laboratory work shall include al least 10practicals on the study of instruction sets of Intel Processors, Programming exercises for 16, 32 and 64bit data processing, Use of Macros and Procedures, IVT and ISR, DSP programming for ImageProcessing such as Image Compression, Image Restoration, Image Enhancement, etc.

Books Recommended:

1. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B.Bray, TMG
2. Advanced Microprocessors by Daniel Tabak McGraw-Hill.
3. Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.
4. Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education
5. Advanced Microprocessors by Y. Rajasree, New Age International.

Semester - III

ELE17009GE: Embedded Systems **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction to Embedded Systems

Definition of Embedded Systems, Embedded Systems vs General Computing Systems, History of Embedded Systems, Embedded System Models, application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems.

Unit II:Typical Embedded Systems

Core of embedded systems, General Purpose and domain specific processors, Memory of embedded systems, embedded system life cycle, types of embedded operating systems, process management (concept, scheduling and scheduling algorithms).

Books Recommended:

1. Introduction to Embedded Systems, A Cyber Physical approach, Edward A.Lee and SenjitSeshia.
2. Embedded Systems Design: An Introduction to Processes, Tools and Techniques by Arnold S. Berger, CMP.
3. Real Time System Design and Analysis by Philips A. Laplante.
4. Real Time Concepts for Embedded Systems, Qing Li, Elsevier, 2011.

Semester - III

ELE010GE: Modern Communication Systems **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Modern Radar AND Satellite Communication

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, Tracking Radar Tracking and Search Radars, Radar Guidance, Importance of Mono Pulse Radar, Satellite Communication Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Domestic Satellite Systems Using Small Earth Stations.

Unit II: Telecommunication Switching Techniques

Time division switching: Time switching, space switching and Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling Multiple Access Techniques Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access.

Books Recommended:

1. J.G. Proakis, "Digital Communication", MGH 4TH edition.
2. Edward. A. Lee and David. G. Messerschmitt, "Digital Communication", AlliedPublishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, "DigitalCommunication Techniques", PHI.

Semester - III

ELE17011GE: Fundamentals of Fuzzy Logic **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations.

Unit II: Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition and aggregation of compound rules. Composition of fuzzy and crisp relations.

Books Recommended:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klirabd B. Yuan, Prentice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, PHI
3. Timothy J. Ross "Fuzzy Logic with Engineering Applications,"Mcgraw Hill,1995
4. Fakhreddine O Karray and Clarance De Silva, "Soft Computing and Intelligent Systems Design,Theory,Tools and Applications", Pearson Education, India,2009

Semester - III

ELE17012GE: Fundamentals of Information Security **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Information security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers, Cryptanalysis. Data scrambling and descrambling Cryptanalysis of classical ciphers. Introduction to modular arithmetic. Differential and linear cryptanalysis.

Unit II: Cryptographic Algorithms and Information Hiding

Introduction to Data encryption standard, Security of DES, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Information Hiding, Need of information hiding, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking.

Books Recommended:

1. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
2. Cryptography and Network Security (2nd Ed.), AtulKahate, TMH
3. Information Systems Security, Godbole, Wiley-India
4. Information Security Principles and Practice, Deven Shah, Wiley-India 5. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", 2nd Edition, Cengage Learning Pub

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Semester - III

ELE17005OE: Computing and Informatics -III **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to algorithms and flow charts, Introduction to programming, types and categories of programming languages. Introduction to C programming language, declarations, data types, expressions, control statements, loops arrays, and functions.

Unit II:Lab Work

Writing C programs using basic programming elements including control statements, arrays, function

Books Recommended:

1. YashwantKanitker "Let Us C" 13th Edition BPB Publication.
2. Michael E. Whitman "Principles of Information Security" 4th Edition, Cengage Learning India.
3. S. K. Srivastava "C in Depth" BPB Publications.

Semester - III

ELE17006OE: Electronic Devices & Circuits-III **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Semiconductors

Conductors, insulators, Semiconductors, Semi-conductor: Intrinsic & Extrinsic Semiconductors. Temperature co-efficient. Definition of P and N types of semiconductor, PN Junction, Junction-Barrier potential.

Unit II: Diodes

Diode, Rectifiers: Half wave-Full wave bridge. Zener Diode, Light Emitting Diode (LED), Photodiode.

Lab Work:

- Finding the I-V characteristics of diode.
- Designing Half wave and full wave rectifiers.
- Testing of Zener Diode.
- Testing of LED.
- Testing of Photodiode.

Books Recommended:

1. Boylestead, Electronic Devices and Circuit Theory.
2. Sidra and Smith, Microelectronic Circuits.

Semester - IV								
ELE17401C: Digital Communication and Information Theory							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	2	3	25	NA	25	25	75

Unit I: Information Theory and Waveform Coding

Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a DiscreateMemoryless Channel, Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy, Channel Capacity, Shannon's Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon-Fano Coding, Huffman Coding, Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

Unit II:Band Pass Digital Carrier Modulation and Channel Coding

Digital modulation techniques: Generation and Detection of Amplitude Shift Keying (ASK), frequency Shift keying (FSK), Phase Shift Keying, and Differential Phase Shift Keying (PSK and DPSK), base band receiver Optimum Filter, Co-relator, Probability of Error in each Scheme,. Error Control Coding: Linear Block codes, (7, 4) Linear Block Coding, matrix representation of linear block codes, Cyclic Codes, polynomial representation (examples).

Unit III: Wide Band Digital Communications and Laboratory Work

Basics of Wide band Systems, Generation of Spreading Codes (PN Codes, Gold Codes), Properties of PN codes, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital CommunicationSystem, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation andDetection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Introductionto Digital Cellular Communication Systems: Architecture of GSM.Performing atleast 10 Practicals across all the units using Matlab and Hardware.

Books Recommended:

1. Digital Communication By Simon Hykin.
2. Digital and Analog Communication by K. Shan Mugam.
3. Digital and Analog Communication by Tomasi.
4. Digital Communications By Bernard Sklar, Pearsons Education.
5. Digital Communications By John G. Proakis McGraw- Hill International Editions.
6. Information Theory Coding and Cryptography by Ranjan Bose, TMH.

Semester - IV								
ELE17402C: Electronic Instrumentation							**Course Category: CORE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	2	3	25	NA	25	25	75

Unit I: Measurements and Instrumentation

Fundamentals of Measurements Errors in measurement; Controlling and Networking of Instruments;Signals and Signal Conditioning; Noise and Interference Transducers: Classification of transducers, characteristics and choice of transducers; Resistance,Capacitance, Piezoelectric, Thermoelectric, Hall effect, Photoelectric,Techogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed, and sound,temperature,pressure, flow, humidity, thickness, pH, position. Counters, Digital frequency meters and time meters, Universal counter timer. Digital Voltmeter: General Characteristics, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Integrating type DVM Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter, Digital tan delta meter, Digital IC tester.

Unit II:Oscilloscopes, Analyzers and Analytical Instruments

Dual trace Oscilloscope, Dual beam Oscilloscope, Sampling Oscilloscope, Analog and Digital Storage Oscilloscope, Harmonic distortion analyzer, Wave analyzer, Frequency selective and Heterodyne waveanalyzer, Spectrum Analyzer, Spectrum Analyzer characteristics, Bio-medical Instruments- ECG, Blood Pressure measurements, Spectrophotometers, Electron Microscope, X-ray diffractometer, Instrumentation Amplifiers and Radio Telemetry.

Unit III: Laboratory Work

The laboratory work shall include minimum 10 practicals on transducers, digital measurements and signal analyzers.

Books Recommended:

1. NihalKularatna, Digital and Analogue Instrumentation testing and measurement, IEE, 2003
2. J. G. Webster, Measurement, Instrumentation and Sensors Handbook, CRC Press, 1999.
3.T. S. Rathore, Digital Measurement Techniques, Narosa Publishing House, New Delhi.

Semester - IV

ELE17403C: Industrial Training and Seminar Work — **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
0	0	6	3	25	NA	NA	50	75

Unit I: Seminar Work (1 Credit)

Each student shall be required to deliver a power point presentation on any topic pertaining to some latest area in the field of Electronics & Communication. Each student shall be evaluated for his/her Seminar Work by a team of faculty members headed by the Seminar Incharge.

Unit II & III: Industrial Training (2 Credits)

The students are required to undergo training at some centre of excellence, outside the State, to get additional exposure in the new and emerging areas in the field of Electronics. Training Incharge/s from the Department shall accompany the students for making necessary academic and other arrangements at the host institute. At the end of the training programme, the performance of the students shall be evaluated by the host institute in collaboration with the Training Incharge.

Semester - IV

ELE17404C: Project Work — **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
0	0	6	3	25	NA	NA	50	75

The students shall be divided into groups, with not more than 4 students in a group. Each group of students shall choose to work on a hardware/software project pertaining to the area of Electronics. Themajor theme of the project shall be to develop a prototype solution for a commercially needfulapplication.Each Project Group shall work under the supervision of Project Guide allocated within/outside theDepartment. The project Reports prepared by the students, as well as the working prototype shall beevaluated by an external Examiner.

Semester - IV

ELE17405DCE: Computer Organization and Architecture — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Structure, Function and Measuring Performance

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, Introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl's and Moore's Laws.

Unit II:Memory Organization, Instruction Set Architecture and I/O Organisation

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Introduction to Virtual Memory, Overlays, Paging, Segmentation, RAID,Instructions and Instruction Set, Addressing Modes. CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register Transfer, Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic, logical and shift units, Micro-operations and instruction execution, I/O Organization – I/O Module, its functions and structure.

Unit III: Data Representation, ALU and Control Unit Design

Scalar Data Types Sign Magnitude, One's and Two's Complement representations of Integers, Integer Arithmetic"s (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic"s (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals. Introduction to Pipelining and Parallel Processing.

Unit IV: Laboratory Work

The Laboratory work shall be based on units I through IV. It shall include digital design of binary adders, subtractors, comparators, fast adders, etc. Chip implementation of various arithmetical and logical circuits, Design of 4/8 bit ALU. Study of Booths algorithm and its hardware implementation, understanding format and representation of various data types in High and low level languages.

Books Recommended:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India

Semester - IV								
ELE17406DCE: CMOS VLSI and Nano-Electronics –IV (Nanotechnology & Nano-electronics)						Course Category: DCE		
Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Nanotechnology and Nano-Electronics

Introduction to Nanotechnology: size dependant physical properties, Melting point, solid state phase transformations, excitons, band-gap variations-quantum confinement, effect of strain on band-gap inepitaxial quantum dots. The p-n junction and the bipolar transistor; metal semiconductor and metalinsulator,Semiconductor junctions; field-effect transistors, MOSFETs

Unit II:Physics of Nanostructures

The Physics of Low-Dimensional Semiconductors: Square quantum well of finite depth, Parabolic and triangular quantum wells, Quantum wires, Quantum dots, Strained layers, Band structure in quantum wells, Semiconductor Quantum Nanostructures and Super-lattices: MOSFET structures, Hetero-junctions,Quantum wells, Super-lattices, Electric Field Transport in Nanostructures: Parallel transport,Perpendicular transport, Quantum transport in nanostructures, Transport in Magnetic Fields and theQuantum Hall Effect

Unit III: Electronic and Optoelectronic Devices Based on Nanostructures

HEMTs, MODFET, Hot Electron Transistors, Resonant Tunneling Transistor, Single Electron Transistor, Quantum Dots and Quantum Cellular Automata. Heterostructure semiconductor lasers ,Quantum well semiconductor lasers, Quantum dot lasers, Quantum well and super lattice photo detectors, Quantum well modulators, Optical luminescence and fluorescence from direct band gap semiconductor nanoparticles.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals across four units using suitable hardware/software platform.

Books Recommended:

1. Hari Singh Nalwa, Encyclopedia of Nanotechnology
2. Bharat Bhusan, Handbook of Nanotechnology, Springer
3. A. A. Balandin, K. L. Wang, Handbook of Semiconductor Nanostructures and Nanodevices
4. Cao, Guozhong, Nanostructures and Nanomaterials - Synthesis, Properties and Applications.
5. J. M. Martínez-Duart, R.J. Martín-Palma and F. Agulló-Rueda, Nanotechnology for Microelectronics and Optoelectronics, Elsevier B.V.

Semester - IV

ELE17407DCE: Wireless Cellular Communication **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Cellular System Fundamentals

Overview of Wireless Communication; Frequency Reuse and Cellular Concept; Co-Channel and Adjacent Channel Interferences; Cell Sectoring and Cell Splitting; Handoff Strategies; ChannelAssignment Techniques.

Unit II:Modulation and Multiple Access Techniques

Performance of Digital Modulation over Wireless Channel; Diversity Techniques; Orthogonal FrequencyDivision Multiplexing (OFDM); Multiple Access Techniques: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), HybridTechniques, OFDMA.

Unit III: Mobile Systems and Standards

Global System for Mobile Communications (GSM); CDMA Cellular System (IS-95); Evolution ofSecond-Generation (2G) Systems; Third-Generation (3G) Systems; Beyond 3G Systems.Wireless LocalLoop; Mobile IP; Wireless Local Area Network (WLAN) Technology; IEEE 802.11 WLAN Standards;Ad Hoc Networking and Wireless Personal Area Networks.

Unit IV: Laboratory Work

Implementation of Multiplexing Techniques, Calculation of Path Loss, Co-relation, Power Spectral Density, Study of various Channel Models, Study of GSM and CDMA Cellular Systems.

Books Recommended:

1. Wireless Communication; Principles and Practice; T.S.Rappaport
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996.
3. Wireless and Digital Communications; Dr.KamiloFeher (PHI)
4. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
5. Mobile Communication Engineering – Theory & Applications; TMH

Semester - IV

ELE17408DCE: Multimedia Technology and Security **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to Multimedia Systems and Processing

Introduction to multimedia systems, Multimedia signals, various sources of multimedia signals, Motivation for growth of multimedia theory, different elements of multimedia communication system, Challenges involved with multimedia signal processing and communication, Image and Video Formation, Video Formation Model, Sampling and Quantization, Image/Video filteringPoint Processing and Mesh Processing.

Unit II:Multimedia Compression

Redundant information in images.Lossless and lossy image compression. Elements of an image compression system, Huffman coding. Limitations of Huffman coding.Arithmetic coding (Basic principal). Encoding and Decoding procedure of an arithmetic coded bitstream. Coding limitations of arithmetic coding. Introduction to Lempel-Ziv and Run length coding. Theory of Quantization, uniform and non-uniform quantization, scalar and vector quantization.Lloyd- Max quantizer.Rate-distortion function, Lossy predictive coding.Pixel encoding using Delta modulation, source coding theorem.

Unit III: Information Security

Need for information security, Information Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains.Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Unit IV: Laboratory Work

Introduction to image processing toolbox.Frequently used commands for image manipulation (IMSHOW,IMREAD, IMWRITE, RAND, RANDN, RANDPERM etc.), Image encryption using MATLAB Implementation of LSB and

ISB algorithms, Frequency domain data hiding in MATLAB.

Books Recommended:

1.Shuman and Thomson, Introduction to Multimedia, Tata Mcgrah Hill 2007.
2. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
3. N. J. Fliege, Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets, Wielypublishers ,1999
4. Lu, S.: Multimedia security: Stegnography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Semester - IV

ELE17409DCE: Fundamentals of RF Circuit Design **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to RF Design and Modelling

Importance of RF Design, RF Behaviour of Passive Components, Chip Components and Circuit Board Considerations, General Transmission Line Equation, Micro Strip Transmission Lines, Single and Multi-Port Networks. RF Diode, Bipolar Junction Transistor, RF Field Effect Transistors, High Electron Mobility Transistor, Diode Models, Transistor Models, Characteristics of Amplifiers, Amplifiers Power Relation, Stability Considerations.

Unit II:RF Filter and Oscillator Design

Overview of RF Filter design, Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise, Amplifier design in various technologies, Power Amplifier design, Design issues in integrated RF filters. Basic Oscillator Model, High Frequency Oscillator Configuration.

Unit III: RF Communication Devices

Basic Characteristics of Mixers. Various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Resonator VCO. designs, Radio frequency Synthesizers - PLL, Various RF Synthesizer architectures and frequency dividers.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals across four units using suitable hardware/software platform.

Books Recommended:

1. Reinhold Ludwig, PavelBretchko, RF Circuit Design, Pearson Education Asia, 2001.
2. B Razavi, Design of Analog CMOS Integrated Circuit, McGraw Hill, 2000.
3. R. Jacob Baker, H.W. Li, D.E. Boyce, CMOS Circuit Design, layout and Simulation, PHI 1998.
4. Y.P. Tsividis, Mixed Analog and Digital Devices and Technology, TMH 1996
5. Thomas H. Lee, Design of CMOS RF Integrated Circuits, Cambridge University Press 1998.

Semester - IV

ELE17410DCE: Biomedical Instrumentation **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Electro-Physiology, Bio-Potential Recording, BioChemical and Non-Electrical Parameter Measurement

The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics. PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, hearing aids, respiratory measurement, oximeter, Blood pressure,Temperature, pulse, Blood cell counters.

Unit II:Assist Devices, Bio-Telemetry and Recent Trends

Cardiac pacemakers, DC Defibrillator, physiotherapy, diathermy, nerve stimulator, artificial kidney machine. Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

Unit III: Medical Imaging

Medical imaging, X-rays, laser applications, ultrasound scanner, Echo-Cardiography, CT Scan MRI/NMR, cine angiogram, colour Doppler systems, Holter monitoring, endoscopy.

Unit IV: Laboratory Work

Measurement of blood pressure, study of ECG and EEG lead systems, study of ECG and EEG graphs, temperature measurement, Respiratory measurement.

Books Recommended:

1. Leislie Cromwell, Biomedical instrumentation and measurement, Prentice Hall of India, New Delhi, 2002.
2. Khandpur, R.S., Handbook of Biomedical Instrumentation, TATA McGraw-Hill, New Delhi, 1997.
3. Joseph J. Carr and John M. Brown, Introduction to Biomedical equipment Technology, John Wiley and Sons, New York, 1997.

Semester - IV

ELE17411DCE: Digital Image Processing **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Review of Image transforms: 2D-DFT, FFT.

Unit II:Image Enhancement

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering.

Unit III: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, losslesspredictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG and MPEG.Image Compression using MATLAB.

Unit IV: Laboratory Work

Introduction to Image processing Toolbox. Frequently used commands in image processing. Algebraic operations on image data. Image filtering and restoration using MATLAB. Image compression using MATLAB.

Books Recommended:

1. Gonzalez and Woods, "Digital Image Processing", 2 Ed, Pearson Education, 2002.
2. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly "The Data compression Book" 2 Ed, bpb Publications.
4. Pratt William K.,"Digital Image Processing", John Wiley & sons
5. M.Sonka,V. Hlavac, R. Boyle, "Image Processing, Analysis and Machine Vision", VikasPublishing House

Semester - IV

ELE17412DCE: Cyber Security and Forensics **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Introduction to Security Threats

Intruders and Hackers, Insider threats, Cybercrimes. Network Threats: Active/ Passive, Worms, Virus, Spam's, Ad ware, Spy ware, Trojans and covert channels.Backdoors, Bots. Spoofing. Internal treats Environmental threats, phishing, and cross-site scripting (XSS), Code injection, Sybil attack, Distributed Denial of Service and other network attacks. Systems Security, Pharming Attacks, IP Spoofing port scanning, DNS Spoofing, SYNattacks, Smurf, attacks, UDP flooding.

Unit II:Web and Email Security

Intrusion Detection and Prevention, Web security requirements, XML, SOAP, WSDL and UDDI, WS Security, SAML, WS-Security Policy, Secure Sockets Layer (SSL), Transport Layer Security (TLS), and Secure Electronic Transaction (SET), HTTPS, Secure Shell (SSH), IP Security: IP Security overview, Architecture, Authentication, Multipurpose Internet Mail Extensions, S/MIME Functionality, S/MIME Messages, Enhanced Security Services, Domain Keys Identified Mail: Internet Mail Architecture, E-mail Threat.

Unit III: Forensics

Forensic Types: Disk Forensics, Network Forensics, Mobile Device Forensics, Live Forensics, Memory Forensics, Multimedia Forensics, Internet Forensics, Cyber Crime Investigations and Digital Forensics, Cyber Laws and Security Policies, Cybercrime, Forensic process, Legal process and Law enforcement, ACPO guidelines, Digital evidence, Investigative tools (Open Source and Proprietary), Email & Browsers, Intrusion detection, Attack trace-back, Packet inspection, Log analysis, Hashing issues, Cloud computing., Using Forensic Software such as FTK, Encase etc.

Unit IV: Laboratory Work

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group.
2. AnkitFadia "Ethical Hacking" 2nd Edition Macmillan India Ltd.
3. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics).
4. John W. Rittinghouse, William M. Hancock, "Cyber security Operations Handbook", ElsevierPub.

Semester - IV

ELE17413DCE: Broadband Wireless Networks — **Course Category: DCE**

Hours Per Week			Total Credits	Maximum Marks				
Lecture	Tutorial	Practical		Assessment - I	Assessment - 2	End Term	Lab	Total
3	0	2	4	25	NA	50	25	100

Unit I: Broadband Networks and Generations

Review of Broadband communication networks DSL, ADSL, HDSL, SDSL, VDSL, Introduction to Broadband Wireless, Evolution of broadband Wireless, Emergence of Standard Based Technology, Mobile Broadband Wireless: Market Drivers and Applications, WiMAX and Other Broadband Wireless Technologies.

Unit II:3G Standards

Brief of 3G cellular systems, WiFi Systems, WiMAX versus 3G and WiFi, Other comparable systems, Spectrum options for broadband wireless, Business and technical challenges of broadband wireless andWiMAX.

Unit III: Beyond 3G – Multicarrier Systems

Overview of WiMAX: IEEE 802.16 and WiMAX, Salient features of WiMAX, WiMAX Physical and MAC layerOverview, OFDM Basics, OFDM in WiMAX, Advanced features for performanceimprovement, WiMAX Reference Network Architecture, Handoff Mechanism, Different types ofServices, QoS Architecture.

Unit IV: Laboratory Work

Study of broad band networks using network and R.F. Communication tools

Books Recommended:

1. Jeffrey G. Andrews, ArunabhaGhosh and RiasMuhamed, "Fundamentals of WiMAX: understanding broadband wireless networking", Pearson Education, 2007.
2. Mobile WiMAX : toward broadband wireless metropolitan area networks / editors, Yan Zhang and Hsiao-Hwa Chen, Auerbach Publications, 2007.

Semester - IV								
ELE17013GE: Foundations of Computer Organization							**Course Category: GE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	0	2	NA	NA	50	NA	50

Unit I: Structure, Function and Measuring Performance

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl's and Moore's Laws.

Unit II: Data Representation, ALU and Control Unit Design

Scalar Data Types Sign Magnitude, One's and Two's Complement representations of Integers, Integer Arithmetic's (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic's (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals. Introduction to Pipelining and Parallel Processing.

Books Recommended:

1. Computer Organization and Architecture by Stallings, PHI
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India

Semester - IV								
ELE17014GE: Mobile Communication							**Course Category: GE**	
Hours Per Week			**Total**	**Maximum Marks**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Assessment - I**	**Assessment - 2**	**End Term**	**Lab**	**Total**
2	0	0	2	NA	NA	50	NA	50

Unit I: Cellular System Fundamentals

Overview of Wireless Communication; Frequency Reuse and Cellular Concept; Co-Channel and Adjacent Channel Interferences; Cell Sectoring and Cell Splitting; Handoff Strategies; Channel Assignment Techniques. Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Hybrid Techniques, OFDMA.

Unit II: Mobile Systems and Standards

Global System for Mobile Communications (GSM); CDMA Cellular System (IS-95); Evolution of Second-Generation (2G) Systems; Third-Generation (3G) Systems; Beyond 3G Systems.Wireless Local Loop; Mobile IP; Wireless Local Area Network (WLAN) Technology; IEEE 802.11 WLAN Standards; Ad Hoc Networking and Wireless Personal Area Networks.

Books Recommended:

1. Wireless Communication; Principles and Practice; T.S.Rappaport
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996.
3. Wireless and Digital Communications; Dr. KamiloFeher (PHI)
4. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
5. Mobile Communication Engineering – Theory & Applications; TMH

Semester - IV

ELE17015GE: Fundamentals of Bio Medical Instrumentation **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Electro-Physiology, Bio-Potential Recording, Bio-Chemical and Non Electrical Parameter Measurement

The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics, PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter,photometer,Blood flow meter, hearing aids, oximeter, Blood pressure, Temperature, pulse, Blood cell counters.

Unit II: Assist Devices, Bio-Telemetry and Recent Trends

Cardiac pacemakers, DC Defibrillator, physiotherapy, diathermy, nerve stimulator, artificial kidney machine. Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

Books Recommended:

1. Leislie Cromwell, Biomedical instrumentation and measurement, Prentice Hall of India, New Delhi,2002.
2. Khandpur, R.S., Handbook of Biomedical Instrumentation, TATA McGraw-Hill, New Delhi, 1997.
3. Joseph J. Carr and John M. Brown, Introduction to Biomedical equipment Technology, JWS, New York, 1997.

Semester - IV

ELE17016GE: Principles of Digital Image Processing **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formationmodel - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters.

Unit II: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- Lossy predictive, transform coding. Fundamentals of JPEG and MPEG. Image Compression using MATLAB

Books Recommended:

1. Gonzalez and Woods, "Digital Image Processing", 2 Ed, Pearson Education, 2002.
2. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly "The Data compression Book" 2 Ed, BPB Publications.
4. Pratt William K.,"Digital Image Processing", John Wiley & sons

Semester - IV

ELE17017GE:Internet of Things (IOT) **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to concepts behind the Internet of Things, Review of technologies enabling IoT- Sensors, Networks, Standards, Augmented intelligence and Augmented behavior, Applications of internet of things, IoT Communication Pattern and Layering concepts, Cellular IoT, IoT cloud.

Unit II:IoT Architectures, Models and Protocols

Overview of IoT architectures (European FP7, WSO2, IVM, CISCO, IoT-A, RAMI4.0, IIRA),IEEE P2413 reference architecture model, Functions of application, network, adaptation, MAC and PHY layers, IoT protocol stack verses traditional protocol stack, Introduction to various IOT protocols (CoAP,6LoWPAN,MQTT,RPL, IEEE 802.15.4, DTLS, ROLL).

Books Recommended:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems Dr. O. Vermesan , Dr. Peter Friess, River Publishers.
2. Interconnecting Smart Objects with IP: The Next Internet, Jean Philippe Vasseur, Adam Dunkels, MorganKuffmann.
3. Internet of Things (A Hands on approach), Vijay Madisetti, ArshdeepBahga.
4. Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally.

Semester - IV

ELE-17007OE: Computing and Informatics -IV **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to Computer Networks, LAN, WAN, MAN, Network topologies, Definition & History of Internet - Uses of Internet - Definition of Web-Addressing-URL-Different types of Internet Connections; Dial up connection, Broad band (ISDN,DSL, Cable), browsers and its types, internet browsing, searching - Search Engines - Portals - Social Networking sites- Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.

Unit II:Lab Work

Working with different type of browsers, E-mails, downloading and uploading of data, social networking, search engines and document types, video conferencing.

Books Recommended:

1. Hasan. A. Sadek "BIOINFORMATICS Principles and Basic Internet Applications" Traford Publishing
2. O. H. U. Heathcote "Basic Internet" 3rd Edition, Payne Gallway Publishing
3. Wendell Odorn "Computer Networking First step" Cisco Press

Semester - IV

ELE17008OE: Electronic Devices and Circuits -IV **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term	Lab	Total
1	0	2	2	NA	NA	50	NA	50

Unit I: Bipolar Junction Transistor (BJT)

Bipolar Junction Transistor (BJT), Types of transistors, Symbol, Biasing of transistor, transistor Configurations. ALPHA & BETA of a transistor. Introduction to JFET and MOSFET.

Unit II:Amplifiers and Oscillators

Amplification, Transistor as an amplifier. Classification of Amplifiers, Class A, B.C. Power amplifier, Impedance matching. **Oscillators,** importance, applications to electrical circuits. Factors controlling oscillation. Types of Oscillators, A.F and R.F Oscillators, Crystal Oscillator, Oscillators used in Radio circuits.

Lab Work:

- Testing a Transistor.
- Terminal determination.
- Calculation of Alpha and Beta.
- Transistor configurations.
- Finding the I-V characteristics of BJT.
- Transistor as an amplifier.
- Finding the I-V characteristics of JFET.
- Finding the I-V characteristics of MOSFET.
- Study of various Oscillators.

Books Recommended:

1. Boylstead, Electronic Devices and Circuit Theory.
2. Sedra and Smith, Microelectronic Circuits.

Syllabus

for

B. Tech. Programme

in

Electronics & Communication Engineering

(REVISED BY BOARD OF STUDIES (BOS) HELD ON 10-09-2013)

P. G. Department of Electronics & Instrumentation Technology
University of Kashmir
Hazratbal, Srinagar-6, J & K

Course Layout

First Year: 1st SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13101	**Mathematics-I**	3	1	0	4	50	100	-	150
ECE-13102	**Applied Physics**	3	1	0	4	50	100	-	150
ECE-13103	**Applied Chemistry**	3	1	0	4	50	100	-	150
ECE-13104	**Introduction to Computing**	2	1	0	3	50	100	-	150
ECE-13105	**Communication Skills**	3	0	0	3	50	100	-	150
ECE-13106L	**Applied Physics Lab**	0	0	4	2	50	-	100	150
ECE-13107L	**Applied Chemistry Lab**	0	0	4	2	50	-	100	150
ECE-13108L	**Computing Lab**	0	0	3	2	50	-	100	150
ECE-13109L	**Engineering Graphics Lab**	0	0	4	2	50	-	100	150
	Total	**14**	**4**	**15**	**26**	**450**	**500**	**400**	**1350**

First Year: 2nd SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13201	**Mathematics-II**	3	1	0	4	50	100	-	150
ECE-13202	**Principles of Electrical Engineering**	3	1	0	4	50	100	-	150
ECE-13203	**Solid State Devices**	3	0	0	3	50	100	-	150
ECE-13204	**Engineering Mechanics**	3	1	0	4	50	100	-	150
ECE-13205	**Computer Programming**	2	1	0	3	50	100	-	150
ECE- 13206L	**Electrical Engineering Lab**	0	0	4	2	50	-	100	150
ECE-13207L	**Engineering Mechanics Lab**	0	0	4	2	50	-	100	150
ECE-13208L	**Computer Programming Lab**	0	0	4	2	50	-	100	150
ECE-13209L	**Workshop**	0	0	2	1	50	-	100	150
	Total	**14**	**4**	**14**	**25**	**450**	**500**	**400**	**1350**

(Revised by Board of Studies on 10-09-2013)

Second Year: 3rd SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13301	**Engineering Mathematics**	3	1	0	4	50	100	-	150
ECE-13302	**Electronic Devices and Circuits-I**	3	1	0	4	50	100	-	150
ECE-13303	**Signals and Systems**	3	1	0	4	50	100	-	150
ECE-13304	**Network Analysis and Synthesis**	3	1	0	4	50	100	-	150
ECE-13305	**Digital Electronics and Logic Design**	3	0	0	3	50	100	-	150
ECE-13306	**Electromagnetic Field Theory**	3	1	0	4	50	100	-	150
ECE-13307L	**Electronic Circuits Lab**	0	0	4	2	50	-	100	150
ECE-13308L	**Digital Electronics Lab**	0	0	4	2	50	-	100	150
	Total	**18**	**5**	**08**	**27**	**400**	**600**	**200**	**1200**

Second Year: 4th SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13401	**Electronic Devices and Circuits-II**	3	1	0	4	50	100	-	150
ECE-13402	**Communication Systems Engineering**	3	1	0	4	50	100	-	150
ECE-13403	**Electronic Instrumentation and Measurements**	3	1	0	4	50	100	-	150
ECE-13404	**Electrical Machines**	3	1	0	4	50	100	-	150
ECE-13405L	**Analog Electronics Lab**	0	0	4	2	50		100	150
ECE-13406L	**Communication Systems Lab**	0	0	4	2	50	-	100	150
ECE-13407L	**Electronic Instrumentation Lab**	0	0	4	2	50	-	100	150
ECE-13408L	**Electrical Machines Lab**	0	0	4	2	50	-	100	150
	Total	**12**	**4**	**16**	**24**	**400**	**400**	**400**	**1200**

(Revised by Board of Studies on 10-09-2013)

Third Year: 5th SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13501	**Linear Integrated Circuits**	3	1	0	4	50	100	-	150
ECE-13502	**Transmission Lines and Antennas**	3	1	0	4	50	100	-	150
ECE-13503	**Digital Signal Processing**	3	1	0	4	50	100	-	150
ECE-13504	**Information Theory and Coding**	3	1	0	4	50	100	-	150
ECE-13505	**Microprocessors**	3	1	0	4	50	100	-	150
ECE-13506	**Computer Organization and Architecture**	3	0	0	3	50	100		150
ECE-13507L	**Linear IC & Digital Signal Processing Lab**	0	0	4	2	50	-	100	150
ECE-13508L	**Microprocessors & Interfacing Lab**	0	0	4	2	50	-	100	150
	Total	**18**	**5**	**08**	**27**	**400**	**600**	**200**	**1200**

Third Year: 6th SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13601	**Digital Communication Systems**	3	1	0	4	50	100	-	150
ECE-13602	**Control System Engineering**	3	1	0	4	50	100	-	150
ECE-13603	**VLSI Technology**	3	1	0	4	50	100	-	150
ECE-13604	**Microwave Engineering**	3	1	0	4	50	100	-	150
ECE-13605	**Power Electronics**	3	1	0	4	50	100	-	150
ECE-13606L	**Digital Communication Lab**	0	0	4	2	50	-	100	150
ECE-13607L	**Power Electronics & Control Engineering Lab**	0	0	4	2	50	-	100	150
ECE-13608L	**Microwave, Transmission Lines & Antenna Lab**	0	0	4	2	50		100	150
	Total	**15**	**5**	**12**	**26**	**400**	**500**	**300**	**1200**

(Revised by Board of Studies on 10-09-2013)

Fourth Year: 7th SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13701	**Data Communication and Computer Networks**	3	1	0	4	50	100	-	150
ECE-13702	**Power Systems**	3	1	0	4	50	100	-	150
ECE-13703	**Microcontrollers & Embedded Systems**	3	1	0	4	50	100	-	150
ECE-13704E	**Elective- I**	3	1	0	4	50	100	-	150
ECE-13705L	**Data Communication and Computer Networking Lab**	0	0	4	2	50	-	100	150
ECE-13706L	**Microcontrollers & Embedded Systems Lab**	0	0	4	2	50	-	100	150
ECE-13707P	**Pre-Project**	0	0	6	3	50	-	100	150
ECE-13708S	**Seminar**	0	0	2	1	50	-	100	150
	Total	**12**	**4**	**16**	**24**	**400**	**400**	**400**	**1200**

ECE-13704E –(Elective-I)

a):Optical Fiber Communication
b): Speech & Audio Processing
c) Digital System Design with HDL
d): Advanced Microprocessors
e): Radar and Satellite Communications

(*Revised by Board of Studies on 10-09-2013)*

Fourth Year: 8th SEMESTER

Course No	Subject	Teaching Periods per week			Credits	Marks			
		Lect	*Tut*	*Prac*		*Sessional*	*Theory*	*Practicals*	*Total*
ECE-13801	**Wireless Communications**	3	1	0	4	50	100	-	150
ECE-13802	**Industrial Organization and Management**	3	0	0	3	50	100	-	150
ECE-13803E	**Elective II**	3	1	0	4	50	100	-	150
ECE-13804E	**Elective III**	3	1	0	4	50	100		150
ECE-13805L	**Wireless Communication & Information Security Lab**	0	0	4	2	50	-	100	150
ECE-13806P	**Project**	-	-	10	5	100	-	200	300
ECE-13807T	**Industrial Training**	-	-	-	2	50	-	100	150
	Total	**12**	**3**	**14**	**24**	**400**	**400**	**400**	**1200**

<u>ECE-13803E (Elective- II)</u>

a): CMOS Circuit Design: Analog and Mixed
b): Digital Image Processing
c): Data Structures
d): Industrial Automation & Control
e): Mechatronics

<u>ECE-13804E-(Elective- III)</u>

a):Neural Networks & Fuzzy Logic
b): R.F. Engineering
c): Information Security
d): Robotics
e): Multimedia Systems

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE-13101

MATHEMATICS– I

UNIT I
Calculus: Differential calculus of functions of several variables, Partial differentiation, Homogeneous functions and Euler‟s theorem, Taylor‟s and Maclaurin‟s series, Taylor‟s theorem and Mean value theorem for functions of two variables, Errors and approximations.

UNIT II
Applications of Differential Calculus: Maxima and minima of several variables, Lagrange‟s method of multipliers for maxima and minima, Curvature of cartesian curves, Curvature of parametric & polar curves.

UNIT III
Applications of Definite Integrals: Application of definite integrals to area, arc length, surface area and volume, Double integrals, Triple integrals

UNIT IV
Vector Calculus: Scalar and vector fields, differentiation of vectors, Velocity and acceleration, Vector differential operator, Del, Gradient and Divergence, Physical interpretation of the above operators, Line, surface and volume integrals.

UNIT V
Application of Vector Calculus: Flux, solenoidal and irrotational vectors, Gauss divergence theorem, Green‟s theorem in plane, Stoke‟s theorem, Applications to electromagnetics and fluid mechanics.

Books Recommended

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Ed., John Wiley, Singapore (2001).
2. Jain, R K and Iyengar S R K, "Advanced Engineering Mathematics", 2nd Ed., Narosa Publishing House, New Delhi (2003).
3. Das & Mukherjee, "Differential Calculus", U.N. Dhur & Sons Pvt. Ltd.
4. Das & Mukherjee, "Integral Calculus", U.N. Dhur & Sons Pvt. Ltd.

Course No: 13ECE-102

APPLIED PHYSICS

UNIT I

Electrostatics: Gradient of a scalar, Divergence and curl of a vector, Gauss‟s law and its applications, Electric potential and electric field (in vector form), Potential due to a monopole, Dipole and multipoles (multipole expansion), Work and energy in electrostatics; dielectrics, Polarization, electric displacement, Susceptibility & permittivity, Clausius Mossotti equation.

UNIT II

Magneto-statics: Lorentz Force Law; magnetic field of a steady current (Biot-Savart law), Ampere‟s law and its applications, Ampere‟s law in magnetized materials, **Electrodynamics** Electromotive force, Faraday‟s law, Maxwell‟s Equations, Wave Equation. Poynting Vector, Poynting Theorm (Statement only), Propagation of EM-Wave in conducting and non-conducting media.

UNIT III

Interference due to division of wavefront and division of amplitude. Young‟s double slit experiment, Interference and principle of superposition. Theory of biprism, Interferences from parallel thin film, wedge shaped films, Newton‟s rings, Michelson Interferometer.
Diffraction: Fresnel‟s Diffraction, Diffraction at straight edges, Fraunhoffer diffraction due to N-Slits, Diffraction grating, dispersive power of grating, resolving power of prism and grating.

UNIT IV

Theory of Relativity: Invariance of an equation and concept of ether, Michelson Morley experiment, Einstein‟s postulates and Lorentz transformation equations, length, time and simultaneity in relativity, addition of velocity, variation of mass with velocity, mass-energy relation, energy- momentum relation.

UNIT V

Quantum Theory: The Compton effect, matter waves; group and phase velocities, Uncertainty principle and its application; time independent and time dependent, Schrodinger wave equation, Eigen values and Eigen functions, Born‟s interpretation and normalization of wave function, orthogonal wave functions, applications of Schrodinger wave equation (particle in a box and harmonic oscillator).

Books Recommended

1. Griffiths D, “Introduction to Electrodynamics”, 2nd Ed., Prentice Hall of India, New Delhi (1998).
2. Beiser, “Perspective of Modern physics” 5th Ed., McGraw-Hill KOGAKUSHA Ltd., NewDelhi (2002).
3. Arya A P “Elementary Modern Physics” Addison-Wesley, Singapore
4. Mani,H S and Mehta G K “Introduction to Modern Physics”, Affiliated East West Press, New Delhi.

(Revised by Board of Studies on 10-09-2013)

Course No: 13ECE-103

APPLIED CHEMISTRY

UNIT I

Molecular Structure and Bonding: The VSEPR model, Valence-bond theory, Molecular orbital theory, Molecular orbitals of polyatomic molecules, The molecular orbital theory of solids.

UNIT II

Reduction Potentials, Redox stability in water, The diagrammatic presentation of potential data, The effect of complex formation on potentials. Electrolytes and non-electrolyte solutions, Kinds of Electrodes, Concentration Cells, The Lead Storage Cell and Fuel Cell.

UNIT III

Laws of Photochemistry, Photo physical processes, Fluorescence and Phosphorescence, Photochemical reactions: photolysis of HI, Photochemical reaction between H2 and Br2, Rotational and Vibrational Spectroscopy-Principles and application to simple molecules, magnetic Resonance Spectroscopy-Principles and Applications to simple molecules.

UNIT IV

Coordination Bond and its Implications: Bonding in tetrahedral and octahedral complexes, Applications in analytical chemistry, Biological system, Catalysis and sandwich Compounds, Oxygen Storage and Transport.
Basic principles of Organic Synthesis: Substitution, Elimination, Addition and Rearrangement Reactions, Reagents used in organic synthesis.

UNIT V

Introduction to Solid State Chemistry, Semiconduction and Superconduction, Thermodynamic and Kinetic Aspects of Chemical Conversion: Free energy and its Implications in Occurrence of a Chemical Reaction, Physical and Chemical Adsorption, Theories of Adsorption, Adsorption Isotherms, Laws of Diffusion and its Implications, Kinetic Aspects of Occurrence of a Chemical Reaction and Examples of Significant Chemical Reactions.

Books Recommended

1. Shriver D F and Atkin A W, “Inorganic Chemistry”,3rd Ed., ELBS, Oxford Press, Delhi (1999).
2. Castellan G W “Physical Chemistry” 3rd Ed., Narosa (1995).
3. Puri, Sharma & Kalia “Inorganic chemistry” (2012)
4. Puri, Sharma & Pathania “Principles of Physical chemistry” (2012)
5. Skoog D A, and Holles F J, “Principles of Instrumental Analysis”, 5th Ed., Hercaurt Asia PTE Ltd., Singapore (2001).
6. Hill J W “Chemistry for changing times” 6th Ed., Macmillan , Canada (1995).

Course No: ECE-13104

INTRODUCTION TO COMPUTING

UNIT I

Computer Appreciation and Organization - Characteristics, Input, Output, storage units, Binary number system, BCD Code, ASCII Code, Hardware Organization of Computer, Central Processing unit, Memory, Secondary Storage Devices, Input Devices, Output Devices, Computer Software & its various types.

UNIT II

Operating Systems – File and directory operations on Windows and Linux Operating Systems, Use of various tools and utilities in Windows and Linux. **Fundamentals of Networking, Internet, and various services offered through the Internet:** Email, WWW, Search engines.

UNIT III

Office Automation Tools – Word processing, Spreadsheets and presentation software. MS Word, Ms Excel, MS PowerPoint. MS word: Mail-merge, indexing, tables, formatting, etc. MS Excel: Functions and formulas, charts, etc. **PowerPoint:** Presentation and Animations**.**

UNIT IV

Introduction to Programming and Problem Solving – Types of Programming Languages- Machine Level, Assembly level, and High Level language, Algorithms, Flow-charts, Compilation, Assembling, Linking and Loading, Testing and Debugging, Documentation, Algorithms for GCD (Greatest Common Division) of two numbers, Test whether a number is prime or not, Sorting Numbers, Finding Square root & factorial of a number, Generation of Fibonacci sequence, Finding largest number in an array, Evaluation of a Polynomial.

UNIT V

Introduction to CAD-Various types of CAD software"s, features, functions and usage of (ElectriCAD, MechCAD, AutoCAD, pSpice, Solid Works)

Books Recommended

1. P.K. Sinha and P. Sinha, "Foundation of Computers" BPB Publishers.
2. C.V Rajaramn, "Fundamentals of computers" PHI publishers

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13105

COMMUNICATION SKILLS

UNIT I

Communication: Meaning, its types, significance, process, Channels, barriers to communication, making communication effective, role in society, Communication model.

UNIT II

Discussion Meeting and Telephonic Skills: Group discussion, conducting a meeting, attending telephonic calls, oral presentation and role of audio visual aids. **Grammar:** Transformation of sentences, words used as different parts of speech one word
substation, abbreviations, technical terms etc.

UNIT III

Reading Skills: Process of reading, reading purposes, models, strategies, methodologies, reading activities. **Writing Skills:** Elements of effective writing, writing style, scientific and technical writing.

UNIT IV

Listening Skills: The process of listening, the barrier to listening, the effective listening skills, feedback skills. **Speaking Skills:** Speech mechanism, organs of speech, production and classification of speech sound, phonetic transcription, the skills of effective speaking, the components of effective talk.

UNIT V

Business Letters: Structure of business letters, language in business letters. Letters of inquiry & their places. Sales Letters, Memorandum, Quotations/tenders, Bank correspondence, Letters of application and appointments, Resume writing, Report Writing, Conducting a Meeting, Minutes of Meeting, Oral Presentation, Group Discussion, CV writing, Purchase order, Job Application Letter.

Books Recommended

1. Rodriques M V, "Effective Business Communication", Concept Publishing Company New Delhi, 1992, reprint (2000)
2. Bhattacharya. Indrajit, An Approach to Communication Skills. Dhanpat rai Co., (Pvt.) Ltd. New Delhi
3. Wright, Chrissie, Handbook of Practical Communication Skills. Jaico Publishing House. Mumbai
4. Gartside L, Modern Business Correspondence. Pitman Publishing London
5. Day, Robert A., How to Write and Publish a Scientific Paper. Cambridge University Press Cambridge
6. Gimson A C, "An Introduction to the Pronunciation of English", ELBS. (YP)
   Bansal, R K and Harrison J B "Spoken English", Orient Longman Hyderabad.

Course No: ECE-13106L

APPLIED PHYSICS LAB

The students are required to conduct experiments on following practical work:

1. Measurement of Resistance.
2. Measurement of e/m by Helical method.
3. Measurement of Numerical Aperture of Optical Fiber.
4. Determination of Resistivity of a given wire.
5. Determination of Band Gap of a semiconductor.
6. Verify Biot-Savart law.
7. To determine the refractive index of the prism material using spectrometer.
8. To verify the laws of vibrating strings by Melde‟s experiments.
9. To determine the wavelength using Fresnsel‟s biprism/diffraction grating.
10. To Determine Plank‟s Constant.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13107L

APPLIED CHEMISTRY LAB

The students are required to conduct experiments on following practical work:

1. To draw the pH-titration curve of strong acid vs. strong base
2. Standardization of KMnO4 using sodium oxalate.
3. Determination of Ferrous iron in Mohr"s salt by potassium permanganate.
4. Determination of partition coefficients of iodine between benzene and water.
5. Determination of amount of sodium hydroxide and sodium carbonate in a mixture
6. Determination of total hardness of water by EDTA method.
7. To verify Bear"s law for a coloured solution and to determine the concentration of a given unknown solution.
8. Synthesis of some polymers like Crazy ball.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE-13108L

COMPUTING LAB

1. Familiarity with various Types of computer System viz. desktop, Workstation, embedded computer, Lap top, Ultra book, *palm top etc.*

2. *Familiarity of various peripherals and their types viz. mouse, keyboard, printer, Scanner, PSC, amplified speaker, flash drive, external hard disc etc.*

3. Familiarity with internal Hardware organization of the computer viz. processor, RAM ,ROM, Hard disk, CD ROM. Mother board, CPU fan, Buses, etc

4. Familiarity with various types of I/O ports viz. parallel port,RS232 com port, USB2.0, USB 3.0, fire wire, VGA, HDMI, Ethernet, PS2*, Audio jack(mono, stereo, head set, A/V),SD/MMC.*

5. Familiarity with various versions of Windows, accessing various run commands of windows for faster and tricky access.

6. Familiarity with various flavors of Linux Operating Systems like Ubuntu, Fedora etc and usage of simple linux commands

7. Use of various tools and utilities in Windows and Linux with file, memory and disk management utilities

8. Familarity with various wordprocessing , spread sheet and multimedia applications like Microsoft word , Microsoft excel, Microsoft powerpoint etc.

9. Working with and understanding web browsers and their applications, Working with Search engines and learning their art. working with email.

10**.** *Assembling the hardware of a computer system and installation of Oper*ating system.

11. Familiarity with networking devices like switch, hub, POE(Power Over Ethernet), LAN Cable, LAN connector, Ethernet card.

12. Writing Algorithms and drawing Flow Charts for stated problems.

(R*evised by Board of Studies on 10-09-2013)*

Course No: ECE-13109L

ENGINEERING GRAPHICS LAB

Introduction to drawing equipment and use of drafting tools, symbols and conventions in drawing. Types of lines and their use, material section representation, introduction to dimensioning.

Using any available CAD software to draw simple machine parts and blocks. Use of various fundamental commands to edit a drawing, e.g. erase, copy, mirror offset, array, move, trim. Use of features, extrude, extrude cut and revolve.

Orthographic projections, projection on horizontal and vertical planes, principal views, different system of projections- symbols-notations.
Projection of points: Projection of points in the first, the second, the third and the fourth quadrant. Projection of lines: Line parallel to both the planes – line parallel to the horizontal plane and perpendicular to the vertical plane, line parallel to HP and inclined to VP, line parallel to HP and inclined to profile plane, line parallel to VP and inclined to PP, line inclined to both the planes.

Projection of solids, projection of solids in first and third quadrant, axis parallel to one and perpendicular to other.
Section of solids: definition of sectioning and its purpose, procedure of sectioning, application to few typical examples.
Development of surfaces: Purpose of development, parallel line method.
Insertion of new planes and drawing necessary features on the plane. Drawing 2D views of 3D drawing. Sectioning and obtaining sectioned views, dimensioning 2d drawing and labelling.

Orthographic projections of simple machine parts, Drawing of blocks and machine parts.
Isometric projection: Basic principle of isometric projection, Isometric projection of simple machine parts for which orthographic views are given.
Introduction to temporary and permanent fasteners: Representation of screw threads and threaded fasteners.
Rivets and riveted joints. Welding symbols.

Introduction to shaft couplings and bearings: assembly of various components of universal coupling and Oldham"s coupling, types of bearings, assembly of various components of bushed bearing and foot step bearing.
Surface modelling of simple components.

Books Recommended

1. Gill P S, "*Engineering Graphics and drafting*", Katria and Sons, Delhi (2001).
2. Bhat N D, "*Elementary Engineering Drawing-Plane and Solid Geometry*", Chartotar Publishing House, Anand (1988).
3. Naryana K L and Kanaiah P, "*Engineering Graphics*", Tata Mc GrawHill Publishing Company Limited, New Delhi (1992).
4. Luzzadde Warren J, "*Fundamentals of Engineering Drawing*", Prentice Hall of IndiaPrivate Limited, New Delhi (1988).
5. Bertoline G R, Wiebe E N, Miller G L, and Mother J L, "*Technical Graphics Communication*", Irwin McGraw Hill New York (1997).

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13201

MATHEMATICS – II

UNIT I

Ordinary and Linear Differential Equations: Formation of ordinary differential equations, Solution of first order differential equations by separation of variables, Homogeneous equations, Exact differential equations, Equations reducible to exact form by integrating factors, Linear differential equations with constant coefficients, Cauchy‟s homogeneous linear equations, Legendre‟s linear equations

UNIT II

Partial Differential Equations: Formulation and classification of PDE‟s, Solution of first order linear equations, Four standard forms of non-linear equations, Separation of variable method for solution of heat, wave and Laplace equation

UNIT III

Matrices: Rank of a matrix, Elementary transformations, Consistency and solutions of a system of linear equations by matrix methods, Eigen values & Eigen vectors, Properties, Cayley-Hamilton‟s theorem

UNIT IV

Probability: Basic concepts of probability, Types of probability: Marginal, joint and conditional, probability rules: Addition, Multiplication, complement; Probability tree, probability under conditions of statistical independence and dependence , Baye‟s Theorm

UNIT V

Random Variables and Distribution: Random variables, Probability distribution, Probability density function, Discrete and continuous distributions- Binomial, Poisson, Normal distributions, Measures of central tendency and dispersion, Sampling distribution, standard error, Central limit theorem

Books Recommended:

1. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley.
2. R. K. Jain & S. R. K. Iyengar, “Advanced Engineering Mathematics”, Narosa Publishing House.
3. Frank Ayres, “Matrices”, Mc Graw Hills.
4. Malik & Arrora, “Advanced Mathematical Analysis”, S. Chand & Co.

CourseNo: ECE-13202

Principles of Electrical Engineering

UNIT I

Electric Circuit Laws: Basic electric circuit terminology, Ohm's law, Kirchhoff‟s current law. (KCL) and Kirchhoff s voltage law (KVL) circuit parameters (Resistance, Inductance and capacitance). Series and Parallel combinations of resistance, Inductance and capacitance.**Energy Source:** Ideal and practical voltage and current sources and their transformation.

Dependent Sources: Dependent voltage sources and dependent current sources.

UNIT II

D.C. Circuit Analysis:

Power and energy relations, Analysis of series parallel d.c. circuits, Delta star (Y) Transformation, Loop and Nodal methods.

UNIT III

Network Theorems:- Statement & Proof of Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem, Superposition theorem and Reciprocity theorem. Related numericals.

UNIT IV

A.C. Circuit Analysis:

Basic terminology and definitions, Phasor and complex number representations, solutions of sinusoidal excited, RC circuits, Power and energy relations in A.C circuits, Applications of network theorems to A.C circuits, Resonance in series and parallel circuits.

UNIT V

Steady State A.C. Three phase Circuits: Concept of a 3 phase voltage, star (Y) circuits. Delta circuits, current and voltage relations in Star and Delta Circuits, characteristics of 3 phase systems.

Books Recommended

1. Del Torro, “Electrical Engineering Fundamentals”, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi (1994)
2. W.H. Hayt and J.E. Kemmerly, “Engineering Circuit Analysis,” Mc-Graw Hill Delhi (1996).
3. B.C. Theraja, “Principles of Electrical Engineering.”
4. Kothari D P and Nagrath I J, “Basic Electrical Engineering”, Tata McGraw Hill, New

(Revised by Board of Studies on 10-09-2013)

Course: ECE- 13203

SOLID STATE DEVICES

UNIT I

Energy bands and charge carriers in semiconductors: energy bands- metals- semiconductors and insulators- direct and indirect semiconductors- charge carriers in semiconductors: electrons and holes- intrinsic and extrinsic material- n-material and p-material- carrier concentration: Fermi level- EHPs- temperature dependence- conductivity and mobility- drift and resistance- effect of temperature and doping on mobility, Hall Effect.

UNIT II

Diffusion of carriers- derivation of diffusion constant D-Einstein relation- continuity equation- p-n junctions: contact potential- equilibrium Fermi levels- space charge at junctions- current components at a junction: majority and minority carrier currents- p-n junction diodes: volt-ampere characteristics- capacitance of p-n junctions.

UNIT III

Zener and avalanche breakdown- Zener diodes: volt-ampere characteristics- Tunnel diodes: tunneling phenomena- volt-ampere characteristics- Varactor diodes- Photo diodes: detection principle- light emitting diodes- volt-ampere characteristics.

UNIT IV

Bipolar junction transistors NPN and PNP transistor action- open circuited transistor- biasing in active region- majority and minority carrier distribution- terminal currents- photo transistors.

UNIT V

Field effect transistors: operation- pinch off and saturation- pinch off voltage- gate control- volt-ampere characteristics- MOS capacitance- MOSFETS: NMOS and PMOS: comparison- enhancement and depletion types- control of threshold voltage.

Books Recommended

1. Semiconductor Physics and Devices, *Basic Principles* by Donald E. Neaman, McGraw-Hill Publishing, 3rd Edition, 2003.
2. Physics of Semiconductor Devices by S. M. Sze, John Wiley and Sons, 2nd Edition, 1981.
3. Solid State Electronic Devices by B. G. Streetman, Prentice Hall of India Ltd, N. Delhi, 5th Edition, 2000.
4. Semiconductor devices. Nagchoudhary- Tata Mc Graw Hill.
5. Integrated electronics – Millman and Halkias- Mc Graw Hill.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13 204

ENGINEERING MECHANICS

UNIT I

Introduction: System of forces, Coplanar concurrent force system, Composition and Resolution of forces, Equilibrium of rigid bodies, Free body diagram, Lami"s Theorem.

Analysis of Framed Structure: Reaction in different types of beams with different end conditions, bending moment and shear stress diagrams. Determination of reactions in members of trusses:

a) Analytical Methods b) Graphical Method

UNIT II

Centre of Gravity and Moment of Inertia: Concept of C.G. and Centroid, Position of Centroid, Theorem of Parallel and Perpendicular Axes, Moment of inertia of simple geometrical figures.

UNIT III

Stress and Strain: Concept of Stress and Strain, Simple Stresses, Tensile, Compressive ,Shear, Bending and Torsion, Stress-Strain Curves, Elongation of bars, Composite bars, Thermal Stresses, Elastic Constants, Mohr"s Circle

UNIT IV

Physical Properties of fluids: System, Extensive and intensive properties: specific weight, mass density, specific gravity, viscosity , specific gravity, surface tension and capillarity , **e**vaporability and vapour pressure**,** Newtonian and Non-Newtonian fluids

UNIT V

Fluids Statics : Pressure, Hydrostatic law, Pascal" s law, Different types of manometer and other pressure measuring devices, Determination of metacentric height.

Fluid Kinematics and Dynamics: Classification of fluids, Streamline, Streakline and Pathlines, Flow rate and continuity equation, Bernoulli"s Theorem, Kinetic energy correction factor and momentum correction factor in Bernoulli"s equation.

Books Recommended

1. Bhavikatti S S and Rajashekarappa K G, *"Engineering Mechanics",* New Age International, NewDelhi (1998).
2. TimoshenkoS P and Young D H, "*Engineering Mechanics*", McGraw Hill(International) 4/e, New Delhi (1984).
3. Kumar D S, " *Fluid Mechanics",* S.K.Katira and Sons, Delhi (1998).
4. Modi P N and Seth S N, "*Fluid Mechanics",* Standard Book House, New Delhi (1998),
5. Engineering Mechanics by R.S. Khurmi

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13205

COMPUTER PROGRAMMING

UNIT I

Introduction to 'C' Language - Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment
statement, Basic input/output statement, Simple „C" programs

UNIT II
Conditional Statements and Loops -Decision making within a program, Conditions, Relational Operators, Logical Connectives, *if* statement, *if- else* statement, Loops: *while* loop, do while, *for* loop, Nested loops, Infinite loops, S*witch* statement, structured Programming.

Unit III
Arrays - One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices,
Functions- Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

Unit IV
Structures and Unions - Structure , nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, **Pointers-** Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.

Unit V
File Processing - Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file. Introduction to Object Oriented Programming with C++ . Objects and Classes. Object hierarchy. Inheritance, Polymorphism. Introduction to Advanced C/C++ Compilers viz. Ellipse/Netbeans.

Book Recommended

1. E. Balaguruswamy, "Programming with ANSI-C"
2. Byron Gottfried "Programming with C"
3. A. Kamthane, "Programming with ANSI & Turbo C"
4. H. Schildt, "C++: The Complete Reference"
5. B. Stroustrup, "The C++ Programming Language"

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13206L

ELECTRICAL ENGINEERING LAB

The students are required to conduct experiments on following practical work:

1. To get familiar with the working knowledge of the following instruments:
ii. Cathode Ray Oscilloscope (CRO).
iii. Multimeter (Analog and Digital).
iv. Function Generator.
v. Power supply.
2. i. To measure phase difference between two waveforms using CRO.
ii. To measure an unknown frequency from Lissajous figures using CRO.
3. Design and use of potentiometer.
4. To convert a galvanometer into ammeter.
5. To convert a galvanometer into voltmeter.
6. Verification of Ohm"s law.
7. Verification of KVL and KCL.
8. Verification of Thevenin"s and Norton"s theorem.
9. Verification of Maximum Power Transfer Theorem.
10. Verification of superposition theorem.
11. Verification of Reciprocity theorem.
12. To plot the resonance curve for a series and parallel resonance.
13. Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply.
14. To verify line and phase voltage.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE- 13207L

ENGINEERING MECHANICS LAB

The students are required to conduct experiments on following practical work:

i) Measurement of Tensile Strength,

ii) Brinell‟s Hardness and Shear Strength of Mild Steel Samples.

iii) Measurement of Compressive Strength of Wooden Sample.

iv) Determination of Moment of Inertia of a flywheel about its axis of rotation.

v) Determination of Moment of Inertia of different lamina by rotation table.

vi) Determination of value of „g‟ using bar pendulum.

vii) Determination of value of „g‟ using Kater‟s pendulum.

viii) Bending beam experiment.

ix) Young‟s Modulus of elasticity determination using Searl‟s Method.

x) Determination of coefficient of viscosity of liquid.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE- 13208L

COMPUTER PROGRAMMING LAB

The students are required to conduct experiments on following practical work:

1. Writing basic C programs.
2. Use of conditional statements and loops in programs.
3. Writing C programs using one and muti-dimentional arrays.
4. Writing programs using functions.
5. Use of pointers and structures in programs.
6. Creation, traversal and operations on Linked lists.
7. Writing basic C++ programs.
8. Using MS visuals studio for writing C/C++ Programs.
9. Using Ellipse/Netbeans for writing C/C++ Programs.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE- 13209L

WORKSHOP

1. **General safety precautions in workshop and introduction.**

2. **Carpentry Shop** :-

Safety precaution, Kinds of wood and timber, Application of timber as per their classification, Carpentry hand tools and machines, Demonstration of wood working machine like, band saw, circular saw, thickness planner, wood working lathe, surface planners etc.

Exercise: Different types of carpentry joint.

3. **Welding Shop** :-

Safety precaution in welding shop, Introduction to gas and arc welding, Soldering and brazing etc, Welding equipment and welding material

Exercise: A simple job on gas/arc welding.

4. **Fitting Shop** :-

Safety precaution, Introduction to fitting shop tools, equipment, Operation and their uses, Marking and measuring practice.

Exercise : A simple job using fitting tools and equipments.

5. **Turning And Machine Shop** :-

Safety precautions, Demonstration and working principles of some of the general machines, like lathe, shaper, milling ,drilling , grinding, slotting etc. General idea of cutting tools of the machines.

Exercise: A simple job on lathe/ shaper.

(Revised by Board of Studies on 10-09-2013)

SEMESTER – 3

Course No: ECE-13301

ENGINEERING MATHEMATICS - I

UNIT I

Fourier Analysis: Fourier series of periodic functions, Even and Odd functions, Half range expansions and Fourier series of different wave forms, Fourier integral Formula, Complex form of Fourier series and practical harmonic analysis. Definition of Fourier Transform, Properties of Fourier Transform. Fourier sine and cosine transform,

UNIT II

Laplace Transforms: Laplace Transform, Shifting Theorem, Laplace transforms of different functions, Heaviside's Unit function, Dirac Delta Function & its Laplace transforms. Inverse Laplace Transforms, Initial and final value theorems, Heaviside"s Expansion Theorem, Convolution theorem , Use of Laplace Transforms in the solution of linear Differential equations.

UNIT III

Z-Transform: Definition, Linearity property, Z- Transform of elementary functions, Shifting Theorems. Initial and final value Theorem, Convolution theorem, Inversion of Z-transforms.

UNIT IV

Complex Analysis Function of a complex variable, Analytic functions, Cauchy-Reimann equations, Complex line integral , Cauchy"s theorem , Cauchy"s Integral formula. Singularities and residues, Cauchy"s Residue theorem and its application to evaluate real integrals.

UNIT V

Numerical solution of algebraic and transcendental equations: Successive bisection method- Regula falsi method - Newton –Raphson method. Numerical solution of ordinary differential equation: Taylor"s series method- Euler"s method–Modified Eulers method – Rungea- Kutta method (IV order).

Books Recommended

1. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
2. Higher Engg. Mathematics: B. S. Grewal- Khanna publishers.
3. Advanced Engineering Mathematics: Michael D Greenberg- PHI.
4. Higher engineering mathematics:H.K.Dass,rajnish Verma-Schand

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE -13302

ELECTRONIC DEVICES AND CIRCUITS – I

UNIT I

Rectifiers and Power supplies: Half wave- full wave, Rectifiers: Centre Tapped and bridge rectifiers-working- analysis and design- C filter analysis- regulated power supplies: series and shunt- design of regulated power supplies for specified output conditions- current limiting- short circuit protection- IC regulated power supplies.

UNIT II

Bipolar Junction Transistors (BJT's) - Transistor Construction, operation- characteristics- small signal model, Types of Transistor Configurations: - CE, CB and CC configurations- comparison- Transistor parameters from static characteristics. Transistor as an amplifier: h parameter model analysis of Transistor at low frequencies- - expression of voltage and current gain- input and output impedance

UNIT III

Transistor Biasing: operating point- DC and AC load lines- Q point selection- bias stability- definition of stability factors- derivation of stability factor for I_{CO} variation- fixed bias- collector to base bias-Voltage divider bias- self bias circuits- bias compensation- compensation for I_{CO} and V_{BE}.

UNIT IV

RC Coupled amplifier: working- analysis and design- phase and frequency response- FET: operation- characteristics- small signal model. FET amplifier: biasing- analysis and design.

UNIT V

Wave shaping circuits: clipping- clamping- RC integration - differentiation- transistor as a switch-astable multivibrator- working and design - UJT- working and applications- simple sweep circuit.

Books Recommended

1. Electronic devices and circuits by R. Boylsted and L. Nashelsky, Prentice Hall Publications, 7th Edition.
2. Electronic devices by Floyd, Pearson Education, 7th Edition, 2008.
3. Electronic Devices and Circuits by K. L. Kishore, BS Publications, 2008.
4. Electronic devices and circuits: Boylsted & Nashelsky- Pearson Edn.
5. Integrated Electronics: Millman & Halkias- Mc Graw Hill.
6. Electronic Principles: Malvino- Tata Mc Graw Hill.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13303

SIGNALS AND SYSTEMS

UNIT I

Introduction to Signals & Systems: Definition of a signal & System, Classification of Signals, Basic operations on Signals, some useful signal models, Systems, classification of systems, system model, Input output relation, impulse response, integro-differential equation and state-space representation. Impulse response, Convolution, Convolution integral, convolution sum, computation of convolution integral system responses, system stability. Block diagram representation.

UNIT II

Fourier Analysis of Signals and Systems: Introduction to Fourier series and Fourier transform: Trigonometric and Exponential Fourier series, Numerical computation of Fourier coefficients, Some properties of fourier transform, signal transmission through LTIC systems, ideal and practical filters, signal energy, applications to Communications, Window functions

UNIT III

System Analysis using Laplace and Z- transform: Definition and its properties, ROC and pole zero concept. Application of Laplace transforms to the LTI system analysis. Correlation, Inversion using duality, numerical based on properties. Signal analysis using LT., system realization, application to feedback and controls, Z- transform, properties of Z- transform

Unit IV

System Analysis in Frequency Domain : Analogy between CTFS, DTFS and CTFT, DTFT problem solving using properties, amplitude spectrum, phase spectrum of the signal and system. Interplay between time and frequency domain using sinc and rectangular signals, sampling of continuous time signals and aliasing, system response and convolution, Discrete Fourier Transform (DFT), properties of DFT, discrete time signal analysis using DFT

UNIT V

Random Signal Analysis: Review of Probability Theory, Random variable and Random process, types of random process, autocorrelation and auto covariance, Gaussian process: Linear transformation, sampling, sufficient statistics for signal processing in white Gaussian noise, Karhunen- Loeve expansion, Whitening filter, the central limit theorem.

Books Recommended

1. Signal and Systems: Simon Haykin- John Wiley.
2. Signals and Systems: Oppenheim Alan- V- Willsky Alan. S- Pearson Edn.
3. Signals and Systems: I J Nagrarth- Tata Mc Graw Hill.
4. Principles of Signal Processing and Linear Systems: B. P. Lathi. OXFORD
5. Adaptive signal processing: W Bernad- Pearson Edn.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13304

NETWORK ANALYSIS AND SYNTHESIS

UNIT I
Circuit Concepts: Review of circuit concepts, Kirchoff"s voltage law, Kirchoff"s current law, Voltage division and current division, Series parallel Network reduction, Loop variable analysis, Node Variable analysis, Loop currents and determinant based solutions, Source Transformations and its Applications

UNIT II
Graph Theory: Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Isomorphism, Network Matrices, Incidence Matrix, Loop Matrix, Fundamental Loop, Cut -Set Matrix, Fundamental Cut Set, Relationship between Matrices, Tellegen"s Theorem and its Applications.

UNIT III
Fourier analysis and Laplace transform - Fourier analysis of periodic signals-Trigonometric and exponential forms- Non periodic signals and Fourier transforms- Frequency spectrum of periodic waveforms - Laplace Transform- Review of theorems-Laplace transform of important signal waveforms - Periodic functions- Initial value and final value Theorems- DC&AC transients-Solution of network problems using Laplace transform.

UNIT IV
Two-port Networks: Voltage and Current ratios of two port networks, Admittance- Impedance-Hybrid and Transmission parameters of two port networks. Two port network synthesis: Introduction to passive network synthesis, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immitance Functions (realized by Foster-I and Foster II form, Cauer-I Form, Cauer-II Form)

UNIT V
Network functions and responses: Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Poles, Zeros and concept of stability, Physical interpretation of Poles and Zeros, Oscillatory response of Poles and Zeros

Books Recommended

1. Network analysis -M.E Van Valkenburg, PHI
2. Network Analysis – G.K. Mithal, Khanna Publishers.
3. Network analysis and synthesis -Franklin F Kuo – John Wiley & Sons
4. Engineering Circuit Analysis -W H Hayt & Jack Kennerly – Mc-Graw Hill
5. Networks and Systems- Ishfaq Hussain -Khanna Publishing Co.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13305

DIGITAL ELECTRONICS AND LOGIC DESIGN

UNIT 1

Number Systems And Boolean Algebra: Review of Number systems, Radix conversion, Complements 9‟s & 10‟s, Subtraction using 1‟s & 2‟s complements, Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical forms, Logic gates.

UNIT II

Digital Logic Families: Introduction to bipolar Logic families: RTL, DCTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family - Totem pole, open collector outputs, TTL subfamilies, Comparison of different logic families.

UNIT III

Combinational Logic: Representation of logic functions, Simplification using Karnaugh map, Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and Demultiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Parity Checker and Magnitude Comparator.

UNIT IV

Sequential Logic Concepts And Components: Flip flops - SR, JK, D and T flip flops - Level triggering and edge triggering, Excitation tables - Counters - Asynchronous and synchronous type Modulo counters, design with state equation state diagram, Shift registers, type of registers, circuit diagrams.

UNIT V

Semiconductor Memories: Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, Charged-Coupled Device memory, PLA, PAL and Gate Array.

Books Recommended

1. Anil K. Maini, “Digital Electronics”, Wiley.
2. Malvino and Leach, “Digital principles and Applications” Tata McGraw Hill.
3. Jain R P “Modern Digital Electronics”, Tata McGraw-Hill, Third Edition, (2003)
4. Mano M Morris, “Digital Design” Pearson Education, Third Edition, (2006)
5. Flecther, “An Engineering Approach to Digital Design”, Prentice Hall of India, New Delhi.
6. Tocci Ronald J, “Digital Systems-Principles and Applications” Prentice Hall of India, New Delhi.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13306

ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate systems and Vector Calculus: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates, differential length, area and volume, line, surface and volume integrals, Del operator, Gradient of a scalar, Divergence of a vector and Divergence Theorem, Curl of a vector and Stokes Theorem, Laplacian of a scalar.

UNIT II

Electromagnetism: Electric fields due to continuous charge distribution, Electric flux density, Electric potential, Relation between E and V, Poisons and Laplace Equations, Uniqueness Theorem, Resistance and Capacitance, Method of images, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Inductors and Inductances.

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UNIT III

Maxwell's Equations: Basic quantities of Electromagnetics, Basic laws of electromagnetism, Transformer and Motional Electromotive forces, Maxwell"s Equations, Surface Charge and Surface Current, Boundary Conditions at media interface (Dielectric and conducting interface).

UNIT IV

Electromagnetic Waves: Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, wave propagation in conducting medium, power flow and pointing vector.

UNIT V

Plane waves at Media Interface: Plane wave in arbitrary direction, plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface, Brew esters angle, fields and power flow at media interface.

Books Recommended

1. Matthew N. O. Sadiku " Principles of Electromagnetic" Oxford International, Fourth edition, 2013
2. Jordon E C and Balmain K G, "Electromagnetic waves and Radiating System", second edition, Prentice Hall New Delhi (1993).
3. Carter G W, "The Electromagnetic Fields in its Engineering aspects", Longmans, Green and Co. London, (1954)
4. Hayt W H, "Engineering Electromagnetics", McGraw Hill Book Co, second Edition, NY (1967)
5. Wazed Miah M A, "*Fundamentals of Electromagnetics*", Tata McGraw-Hill, New Delhi, (1982).
6. Shivgoankar Transmission Lines and Waves " Tata McGraw Hills 3rd Edition 2011.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE -13307L

ELECTRONIC CIRCUITS LAB

The students are required to conduct experiments on following practical work:

1. To obtain diode characteristics of diodes IN4001, IN4002, IN4003 and IN4004.
2.
   a) To simulate & assemble a Half -wave and a Full wave rectifiers (bridge and center-tapped) and to study their performance.
   b) To suppress the ripple of Half-wave rectifier, bridge and center-tapped rectifiers using RC filter.
3. To simulate & obtain Zener diode characteristics and to use Zener diode as a voltage regulator
4. To simulate & assemble a Zener diode based voltage regulated power supply with short circuit protection.
5. To simulate & assemble an IC voltage regulator based power supply of 5, 6, 8, -5, -6, -8 volts.
6. To simulate & assemble and observe the performance of clipping and clamping circuits.
7. To simulate & assemble a CB amplifier and observe their performance.
8. To simulate & assemble a CE amplifiers with various biasing configurations.
9. To simulate & assemble a two stage RC-coupled amplifier and observe its output.
10. Determination of Z, Y, h, ABCD parameters of a symmetrical network.
11. Determination of Z, Y, h, ABCD parameters of unsymmetrical network.
12. Verification of equivalence of star and delta transformation.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13308L

DIGITAL ELECTRONICS LAB

The students are required to conduct experiments on following practicals:

1. Verification of the truth tables of TTL gates (7400, 7402, 7404, 7408, 7432, 7486….).
2. Verify the NAND and NOR gates as universal logic gates.
3. Simulation & Implementation of basic gates using DDL, DTL, RTL, TTL and CMOS Logic.
4. Design and simulation of basic digital circuits using totem-pole and open-collector logic with sourcing and sinking configuration.
5. Verification of the truth table of the Multiplexer 74150 and De-multiplexer 74154.
6. Design and verification of truth table of Half and Full Adder, Subtractor Circuits.
7. Logic family interconnection (TTL to CMOS and CMOS to TTL).
8. Design and test of an SR F/F using NAND/NOR gates.
9. Verify the truth table of a J-K F/F (7476), D-F/F (7474).

(R*evised by Board of Studies on 10-09-2013)*

Course No: ECE-13401

ELECTRONIC DEVICES AND CIRCUITS – II

UNIT I

High frequency equivalent circuit of a transistor. Hybrid pi model- explanation of components -r parameters in terms of h parameters -Tuned amplifiers -principle - single tuned and double tuned amplifiers -frequency response -applications (no analysis) -multistage amplifiers -frequency response.

UNIT II

Feedback -different types -positive, negative, voltage, current, series and shunt feedback- Feedback in amplifiers -its effect on amplifier performance -typical feedback arrangements -emitter follower- Darlington emitter follower -cascade amplifier (principles only) -difference amplifier.

UNIT III

Oscillators -conditions for oscillation -analysis and design of RC phase shift oscillator, general form of oscillator circuit -working of Hartley, Colpitt's, Crystal, tuned collector and Wien Bridge oscillators.

UNIT IV

Astable, Mono-stable multivibrator -analysis - design - applications - triggering - Bistable multivibrator -analysis and design -different methods of triggering -commutating capacitor -Schmitt trigger-working -design.

UNIT V

Large signal amplifier -harmonic distortion -analysis of class A, class B, class C and class D amplifiers -complimentary and symmetry stage -sweep generators -voltage and current sweeps -time base generators -linearization -miller and bootstrap sweeps - applications.

Books Recommended

1. Electronic Devices and Circuits by K. L. Kishore, BS Publications, 2008.
2. Electronic devices and circuits -Boylsted & Neshelsky, Pearson Edn.
3. Integrated electronics -Millman & Halkias, Mc Graw Hill
4. Electronic principles –Malvino
5. Electronic Device II by U.A Bakshi; Technical Publications
6. Microelectronics Digital and Analogue -Botkar.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE-13402

COMMUNICATION SYSTEMS ENGINEERING

UNIT I

Signals and Spectra: Introduction to Signals and its classification, Properties of Signals and Noise, physically realizable waveforms, time average operator, spectra and Fourier transform, properties of Fourier transform, Parsevals theorem and Energy Spectral Density, Power Spectral Density and Autocorrelation Function, Orthogonal series representation of signals and noise.

UNIT II

Amplitude Modulation/Demodulation Techniques: Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of Amplitude Modulation, Double Side band Suppressed Carrier, (DSB- SC) System: Mathematical Analysis, Generation and Demodulation of DSB- SC signals, Costas receiver.

UNIT III

SSB Transmission/SSB Reception: Advantages of SSB transmission, Hilbert Transform, properties of Hilbert transform, applications of Hilbert Transform, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation.

UNIT IV

FM Modulation/ Reception: Concept of Angle Modulation: Mathematical theory, Phasor Representation of Angle modulated signal, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission. FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, Foster Selay or Phase Discriminator, FM Detector using PLL and Stereo FM Multiplex Reception.

UNIT V

Performance of Analog Communication Systems: Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise equivalent Band-width, Effective Noise temperature, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Books Recommended:

1. Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.
2. George Kennedy, “Electronic Communication System”, McGraw- Hill.
3. Gary M. Miller and Jeffery S. Beasley, “Modern Electronic Communications “, PHI.
4. Simon Haykin, “ Communication Systems”, 8th edition, Wiley Pubclishers.
5. Wayne Tomasi, “ Electronics Communication systems”, 4th edition, Pearson Publishers.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE-13403

ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

UNIT I

Measurement Systems and Characteristics Of Instruments: Introduction- Measurements, Significance of measurements, Methods of measurements, Instruments and measurement system, Electronic instruments, Classification of instruments, Deflection and Null type instruments, Comparison Analog and Digital Modes of operation, Application of measurement system, Errors in measurements, Types of errors, Accuracy and Precision, Noise, Resolution or discrimination, loading effects, Units, Absolute units, Fundamental and Derived units.

UNIT II

Bridges: Bridge Circuits for RLC Measurements: Measurement of R, L and C, Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges Measurement of Inductance, Capacitance, Effective resistance at high frequency, Q-Meter.

UNIT III

Electronic Instruments: Introduction-Electronic Voltmeter, Electronic multimeter, Logic Analyzer, Network Analyzer, Function generator, Wave analyzer, Harmonic Distortion Analyzer, Spectrum Analyzer. Cathode Ray Oscilloscope: Introduction- CRO, Cathode ray tube, Block diagram of CRO, Measurement of voltage, phase and frequency using CRO, Special purpose oscilloscopes.

UNIT IV

Transducers, Sensors and Actuators: Principles of operation, Classification of transducers based upon principle of Transduction, Summary of factors influencing the choice of transducer, Qualitative treatment of Strain Gauge, LVDT, Thermocouple, Piezo-electric crystal and Photoelectric transducers, Sensors for hostile environments, Actuators: Relays, Solenoids, Stepper motors.

UNIT V

Introduction to Data Acquisition Systems: Components of data acquisition system, Interfacing of transducers, Single Channel and Multi channel system, Multiplexing, Automated data acquisition.

Books Recommended

1. A. K. Sawhney, " Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons.
2. H.S. Kalsi, "Electronic Instrumentation "
3. J. B. Gupta JB "Measurements and Instrumentation", S K Kataria & Sons, Delhi, First Edition (2003)
4. W.D. Cooper, A.D. Helfrick, "Modern Electronic Instrumentation and Measurement Techniques",PHI
5. D.V.S. Murthy, "Transducers and Instrumentation", Prentice Hall of India, New Delhi, Tenth Edition (2003).

(Revised by Board of Studies on 10-09-2013)

Course No: ECE-13404

ELECTRICAL MACHINES

UNIT I

Transformers: Operating principle, classification, construction, Emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test, autotransformers, three-phase transformer connections, impedance matching, isolation & instrument transformers.

UNIT II

D.C. Machines: Operating principle, generator & motor action, torrque equations, power stages & efficiency, Separately excited Generators. Characteristics & applications of d.c generators, d.c motors, Losses & efficiency of d.c. machines, Hopkins & Swinburne‟s Test.

UNIT III

Induction Machines: Three-phase induction motors. Principle of operation, construction, types, Rotating magnetic field, Emf equation of an AC Machine, torque developed in an AC machine, equivalent circuit model, torque-speed characteristics, starting and speed control Torque-Slip Characteristics, PowerSlip Characteristics, Methods of starting of Squirrel Cage Shroud Rotor motors,

UNIT IV

Synchronous Machines: Construction, types & operating principle of synchronous generator, AC armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change. Synchronous Motor, Different starting methods, Equivalent circuit, Phasor diagram, Torque and Power Relations, Effect of Load changes on Synchronous motors.

UNIT V

Introduction to special Machines: Repulsion motor, Ac- Series Motors, Universal motors, Hysteresis motors, Reluctance motor, Servo motors.

Books Recommended:

1. M.G. Say: Performance design of Ac Machines, Pitman, ELBS
2. DS Bhimbra: Electrical Machinary : Khanna Publishers.
3. K. Murukesh Kumar: Induction & Synchronous machinesb- Vikas Publishing
4. Fitz Gerald A.E & Kingsley; Electrical Machinary, Tata Mc_Graw hills
5. Electric Machinery by Nagrath.
6. Electrical Machines by B.L. Thereja.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE -13405L

ANALOG ELECTRONICS LAB

The students are required to conduct experiments on following practical work:

1. Power amplifiers: Design & simulate class A and class AB push-pull power amplifiers and verify their power output.
2. Study of IC power amplifier.
3. Oscillators: Design & simulation of RC phase shift, Weinbridge, Hartley and Colpitts oscillators.
4. Design and Simulation of Tuned amplifiers.
5. Study, design and simulate Darlington emitter-follower configuration.
6. Design and simulate monostable, astable and bistable multivibrators using 555 Timer.

(*Revised by Board of Studies on 10-09-2013)*

Course No: ECE- 13406L

COMMUNICATION SYSTEMS LAB

The students are required to conduct experiments on following practical work:

1. To study analog Multiplier (AD633)
2. To Design and Simulate AM using a diode/transistor and Analog Multiplier also determine the depth of modulation.
3. To Design and simulate envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
4. To Design and Simulate Frequency modulation .
5. Frequency Demodulation using Discriminators.
6. Study of PLL and detection of FM signal using PLL.
7. Generation & simulation of DSB-SC signal using balanced modulator.
8. Generation & simulation of SSB signal.
9. To Implement and Simulate Hilbert Transformer.
10. To Simulate VSB Modulator and Demodulator.
11. Measurement of Noise Figure using a Noise generator.
12. Study the functioning of super heterodyne AM receiver.
13. Measurement of Sensitivity, Selectivity and Fidelity of radio receivers.
14. Noise power spectral density measurement.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13407L

ELECTRONIC INSTRUMENTATION LAB

The students are required to conduct experiments on following practical work:

1. To study the working of DSO and saving various waveforms on its memory.
2. Measurement of inductance by Maxwell‟s bridge.
3. Measurement of small resistance by the Kelvin‟s bridge.
4. Measurement of medium resistance with the help of Wheatstone bridge.
5. Measurement of capacitance by Schering bridge.
6. To find Q of a coil by a series resonance method and verify it by using Q-meter.
7. Study the operation and characteristics of various temperature transducers viz. Thermocouple, RTD, Thermistor, IC LM35 Temperature Sensor.
8. To study the operation and characteristics of various optical transducers viz. photovoltaic cell, photo-diode, photo-transistor, APD.
9. To study the operation and characteristics of various physical transducers viz. LVDT, Strain-Gauge, Linear Potentiometer, Linear Optical Decoder, etc.
10. To study the operation and characteristics of Solar Panel.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE- 13408L

ELECTRICAL MACHINES LAB

The students are required to conduct experiments on following practical work:

1. Familiarity with Power Transformer, Auto Transformer, Dimmer stat, Servo Stabilizer.
2. Determination of open circuit characteristics (OCC) of a DC machine.
3. Starting and speed control of a DC shunt motor.
4. Connection and testing of a single-phase energy meter (unit power factor load only).
5. Two-wattmeter method of measuring power in three-phase circuit (resistive load only).
6. Poly phase connection of single phase transformer.
7. To determine the armature and field resistance of a DC Machine.
8. To calibrate a test (moving iron) ammeter and a (dynamometer) wattmeter with respect to standard (DC PMMC) ammeter and voltmeters.
9. Open circuit and short circuit tests on a single phase transformer.
10. Connection and starting of a three-phase induction motor using direct on line (DOL) or star delta starter.

(Revised by Board of Studies on 10-09-2013)

Course No: ECE 13501

LINEAR INTEGRATED CIRCUITS

UNIT I

Introduction to operational amplifiers – Basic differential amplifier - dual input balanced output and unbalanced output, Emitter coupled differential Amplifier, Transfer characteristics of differential Amplifier, Current Mirrors, Active Loads, Internal block schematic of op amp - Pin identification-power supply requirements - typical data sheet - Op-amp parameters - ideal op amp - transfer curve – equivalent circuit- open loop configurations - frequency response of op amps - compensating networks – slew rate and its effect.

UNIT II

Op Amp in closed loop configuration: Different feedback configurations- Voltage series feedback and voltage shunt feedback - concept of virtual ground- voltage follower - Instrumentation amplifiers: Differential amplifiers with one op amp and 3 op amps- Use of offset minimizing resistor (ROM) and its design, AC amplifiers, Log and antilog amplifiers, Sample and hold circuits.

UNIT III

Differentiator and integrator, Precision Rectifiers, Clippers and Clampers, Peak Detector, Summing, Scaling and Averaging amplifiers, V to I and I to V converters, Comparators, Applications of comparators, Schmitt-trigger, Square wave and triangular wave generators, pulse generators, voltage time-base generators,

UNIT IV

Phase-shift & Wein bridge Oscillators, Voltage controlled oscillator. Characteristics of data converters, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation). Sinusoidal Oscillators: Phase shift oscillator, Wien-bridge oscillator.

UNIT V

Phase Locked Loop- Operating principles and applications, Voltage Regulators - Fixed, adjustable and switching regulators, 555 Timer- its applications as Monostable and Astable multivibrators
Specialized ICs: 78XX and 79XX series- 317 variable regulators- 1723 switching regulators, 565 PLL, 566 VCO chip, LM 380 power amplifier

Books Recommended

1. Op amps and Linear Integrated circuits: Ramakand Gaykwad- PHI publications.
2. Op amps and Linear Integrated circuits: R F Coughlin- Pearson Education.
3. Microelectronics: Digital and analog circuits and systems: J. Millman
4. Linear Integrated circuits: Roy Choudhary & Jain- Wiely Eastern Publications.
5. Integrated circuits: K R Botkar

Course No. ECE-13502

Transmission Lines & Antennas

Unit -I: introduction to Transmission Lines

Introduction to different transmission lines, Concept of distributed elements, equation of voltage and current, phase and attenuation constants, standing wave and impedance transformation, loss-less and low-loss transmission lines,impedance characteristics of a loss-less line, Power transfer on a transmission line.

Unit- II: Analysis of Transmission lines

Analysis of transmission lines in terms of impedances and Admittances, Graphical representation of a transmission line, impedance smith chart, constant resistance circles, The smith chart, constant VSWR circles, Admittance smith chart,

Unit- III: Applications of Transmission Lines

Measurement of unknown impedance, Transmission line as a circuit element, transmission lines as a resonant circuits, voltage or current step-up transformer, impedance matching using transmission lines, quarter-wavelength transformer, single and double stub matching technique, standing-wave pattern on a line-width matching unit, measurement of line parameters.

Unit- IV: Antenna Radiation Mechanism

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna.

Unit- V :Practical Antennas

Folded dipole antennas, modification of folded dipoles, loop antennas, far- field patterns of circular loop antennas, horn antennas, rectangular horn antennas, the paraboloidal reflector, spherical reflector, introduction to microstrip antennas, some salient features of microstrip antennas, rectangular microstrip antennas, applications of microstrip antennas.

Books Recommended

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition
2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill

Course No: ECE 13503

Digital Signal Processing

Unit –I: Introduction

Introduction: Limitations of Analog signal processing, Advantages of digital signal processing and its applications; Conversion of Analog signals to digital domain: Sampling, Quantization, Encoding, Aliasing. Some elementary discrete time sequences and systems; Basic elements of digital signal processing: convolution, correlation and autocorrelation, Concepts of stability, causality, linearity.

Unit –II: Discrete Fourier Transform (DFT)

Introduction, DTFT and DFT, Properties of DFT, Linear Filtering Techniques based on DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT algorithms, Properties of WN, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

Unit -III: Z-Transform

Definition, Region of Convergence, Properties of Z-Transform; Convolution theorm, Parsevals theorm, Unilateral Z Transform, Solutions of discrete systems using Z-Transform, Inverse Z-Transform.

Unit -IV: Infinite Impulse Response (IIR) Filters

Frequency response for rational system functions, All pass minimum phase functions; Basic structures for IIR systems: Design of IIR from continuous time filters, Frequency transformation of IIR low pass filters.

Unit -V: Finite Impulse Response (FIR) Filters

Linear systems with generalized linear phase; Basic network structures for FIR filters; Types of Windows, Rectangular, Triangular, Haan, Hamming and Kaiser, Design of FIR filters using windows, Comparison of FIR and IIR filters. Introduction to finite word length effects in DSP.

Books Recommended:

1. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
2. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
3. Digital Signal processing, A computer based approach, Sanjit K. Mitra. McGraw Hill Education.
4. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

Course No: ECE -13504

Information Theory and Coding

Unit-1 Introduction to Information Theory

Information – Entropy, properties of entropy Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

Unit- II Error Control Coding: Block Codes

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC, Introduction to (BCH) Codes, Reed Solomon Codes.

Unit-III Error Control Coding: Convolutional Codes

Convolutional codes – code tree, trellis, state diagram, Polynomial Description of Convolutional codes, Distance Notions for Convolutional Codes, generating function - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

Unit-IV Trellis Coded Modulation

Introduction to TCM, the concept of Coded Modulation, Mapping by set Partioning, Ungerboeck's TCM design rules, TCM Decoder, Performance Evalauation for AWGN and Fading Channels.

Unit- V Coding for Secure Communications

Introduction to Cryptography, An overview of Encryption Techniques, operation used by Encryption Algorithms, Symmetric (Secret Key) Cryptography, Data Encryption Standarad (DES), IDEA, The RSA algorithm, Secure communication using Chaos Functions.

Books Recommended

1.R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2.FredHalsall, "Multidedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002
3.KSayood, "Introduction to Data Compression" 3/e, Elsevier 2006
4.SGravano, "Introduction to Error Control Codes", Oxford University Press 2007
5.Amitabha Bhattacharya, "Digital Communication", TMH 2006

Course No: ECE -13505

Microprocessors

UNIT 1

Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization Microprocessor Architecture and Operations, Memory, I/O devices, Memory and I/O operations

UNIT II

8085 Microprocessor Architecture, Address, Data And Control Buses, 8085 Pin Functions, Demultiplexing of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing, Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing, Assembling & Executing A Program, Debugging The Programs.

UNIT III

Writing 8085 assembly language programs with decision, making and looping using data transfer, arithmetic, logical and branch instructions ,Stack & Subroutines, Developing Counters and Time Delay Routines, Code Conversion, BCD Arithmetic and 16-Bit Data operations .

UNIT IV

Interfacing Concepts, Ports, Interfacing Of I/O Devices, Interrupts In 8085, Programmable Interrupt Controller 8259A, Programmable Peripheral Interface 8255A, Advanced Microprocessors: 8086 logical block diagram and segments, 80286: Architecture, Registers (Real/Protected mode), Privilege levels, descriptor cache, Memory access in GDT and LDT, multitasking, addressing modes, flag register

UNIT VI

80386: Architecture, Register organization, Memory access in protected mode, Paging 80486: Only the technical features, Pentium : Architecture and its versions, SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format , ARM Processor: Architecture features, Logical block diagram of ARM7 architecture

Books Recommended:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International.
2. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Oxford
3. Advanced Microprocessors, Daniel Tabak, McGrawHill
4. Microprocessor & Interfacing - Douglas Hall, TMH
5. 8086 Programming and Advance Processor Architecture, Savaliya M. T., WileyIndia
6. The 8088 and 8086 Microprocessors, Triebel & Singh, Pearson Education

Course No. ECE-13506

Computer Organization and Architecture

Unit I: Structure, Function and Measuring Performance

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer
Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl's and Moore's Laws.

Unit II: Memory Organization and I/O Organization

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence. Introduction to Virtual Memory, Overlays, Paging, Segmentation, Fragmentation, RAID and CAM. I/O Organization – I/O Module, its functions and structure, I/O Techniques, Introduction to I/O Interfaces.

Unit III: Instruction Set and Register Set Architecture

Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes. CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purposeregisters, Stack based CPU, Micro-operations and RTL – Register Transfer, Bus and Memory Transfer,Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic,logical and shiftunits, Micro-operations and instruction execution.

Unit IV: Data Representation and ALU Design

Scalar Data Types Sign Magnitude, One's and Two's Complement representations of Integers, Integer Arithmetic's (Negation, Addition, Subtraction, Multiplication, Division, Increment and Decrement). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic's (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization

Unit V: Control Unit Design

Control Unit – Functional Requirements, Structure, Control Signals, hardware and Micro-programmed /Wilkes Control unit, Micro-instructions and its formats, Microprograming sequence, Wide-Branch Addressing, Emulation, Control Memory. Introduction to Pipelining, Pipeline performance, Introduction to Parallel Processing, Classification of Parallel structures.

Books Recommended:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India
5. Computer Organization and Design byHamacher, Varnesic&Zaky, McGrawHill.

Course No. ECE-13507L

Linear IC Laboratory and Signal Processing Lab

1. Measurement of op-amp parameters - CMRR, slew rate, open loop gain, input and output impedances.
2. Inverting and non-inverting amplifiers, integrators and differentiators – frequency response.
3. Instrumentation amplifier - gain, CMRR and input impedance.
4. Single op-amp second order LPF and HPF - Sallen-Key configuration.
5. Narrow band active BPF - Delyiannis configuration.
6. Active notch filter realization using op-amps.
7. Wein bridge oscillator with amplitude stabilization.
8. RC phase shift oscillator.
9. Astable and monostable multivibrators using op-amps.
10. Square, triangular and ramp generation using op-amps.
11. Astable and monostable multivibrators using IC 555.
12. Linear sweep generation using IC 555.
13. Design of PLL for given lock and capture ranges & frequency multiplication.
14. Precision limiters using op-amps.
15. Log and Antilog Amplifiers. 16. Sample and Hold Circuit.
16. Analog-to-Digital Converter. 18. Digital-to-Analog Converter.
17. Study of 78XX and 79XX series of voltage regulators.
18. Study of 317 variable voltage regulator.
19. Study of 565 PLL chip.
20. Applications of PLL.

    Signal Processing Laboratory :

21. Write a program in Matlab to generate standard sequences.
22. Write a program in Matlab to compute power density spectrum of a sequence.
23. To write a Matlab program for noise reduction using correlation and autocorrelation methods.
24. Write a program in Matlab to verify linear convolution.
25. Write a program in Matlab to verify the circular convolution.
26. To write a Matlab programs for pole-zero plot, amplitude, phase response and impulse response from the given transfer function of a discrete-time causal system.
27. Write a program in Matlab to find frequency response of different types of analog filters.
28. Write a program in Matlab to design FIR filter (LP/HP) through Window technique
29. Using rectangular window
30. Using triangular window

Course No: ECE-13508L

Microprocessor and Interfacing Lab

1. Familiarization with 8085 trainer kit, manual code entry.
2. Addition/Subtraction of 8, 16 bit numbers.
3. Multi-byte addition and subtraction.
4. Multiplication/Division of 8, 16 bit numbers.
5. Finding Maximum and minimum inan array of 8-bit and 16-bit numbers.
6. Copy a block of data from one portion of memory to another.
7. Packing and Unpacking of BCD numbers.
8. Addition of Packed and Unpacked BCD numbers.
9. Binary to BCD conversion.
10. BCD to Binary conversion.
11. Factorial ofa given number using iteration and procedures.
12. Generation of Fibonacci series.
13. Other programs using iteration and procedures.

Interrupts and Interfacing:

14. Stepper motor interfacing with microprocessor,
15. DC motor controller.
16. Traffic light controller interfacing using 8255 with microprocessor,
17. ADC interfacing with microprocessor.
18. Interfacing Logic Controller with Microprocessor
19. Interfacing Elevator with Microprocessor.
20. Interfacing Dual DAC with Microprocessor.
21. Interfacing 8253 with Microprocessor.

Note: Laboratory experiments shall be carried out using simulators, assemblers and trainer kits.

ECE-13601

Digital Communication Systems

Unit I: Signal Space Analysis and Detection

Geometric Representation of Signals; Gram Schmidt Orthogonalization Procedure; Detection of Known Signals in Noise; MAP and ML Criteria; Probability of Error; Correlation and Matched Filter Receivers; Estimation: Concepts and Criterion

UNIT II: Pulse Code Modulation

Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

Unit III Pass band Communication

Introduction; ASK, PSK, FSK, QPSK, QAM and MSK; Power Spectra of Baseband and Passband Signals; Coherent and Non-coherent Detection of Modulated Signals; base band receiver Optimum Filter, Correlator Probability of Error in Detection; Comparison of Various Modulation Techniques.

Unit-IV Intersymbol Interference and Equalization.

Introduction, inter-symbol interference, Nyquist criterion for zero ISI, Optimum demodulator for band-limited channel, condition for maximum SNR_O, condition for zero ISI, Zero forcing linear equalizer (ZF-LE), mean- square error linear equalizer (MSE-LE), Zero-forcing decision-feedback feedback equalizer (ZF-DFE), Mean-square error decision-feedback equalizer (MSE-DFE).

Unit-V Spread Spectrum Signals for Digital Communication:

Introduction to spreading codes, Generation of PN Sequence, properties of PN codes, Model of Spread Spectrum Digital Communication System – Direct Sequence Spread Spectrum Signals – Error Rate Performance of the Decoder, Some Applications of DS Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals – Performance of FH Spread Spectrum Signals in an AWGN Channel, CDMA System Based on Spread Spectrum .

Books Recommended

1. G J Proakis, Digital Communication, 5th Edition, McGraw Hill, 2008.
2. S Haykin, Digital Communication, Wiley, 1988.
3. B P Lathi and Z Ding, Modern Digital and Analog Communication Systems, 4th Edition, Oxford Univ Press, 2010
4. Tri T Ha, Theory and Design of Digital Communication, Cambridge Univ Press, 2010.
5. Van Trees, Detection, Estimation and Modulation Theory, Vol 1 and 2, John Wiley, 2004
6. R Bose, Information Theory, Coding and Cryptography, 2nd Ed, Tata McGraw Hill, 2008.
7. G R Cooper and C D McGillem, Modern Communication and Spread Spectrum, McGraw Hill, 2006.
8. S Haykin and M Moher, Communication Systems, 5th Ed, Wiley, 2009

ECE-13602

Control Systems Engineering

Unit I: Control Systems and System Representation

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods, Control ofPhysical Systems: Speed and temperature.

Unit II: Time Domain Analysis of Control Systems

Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit III: Stability and Frequency Analysis

Stability : Conditional an absolute stable systems, location of poles and stability, Routh- Herwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit IV: Introduction to Controller Design

Control system design - preliminary considerations, Need for compensation, lead, lag and lead - lag Compensation, Transfer functions of lead, lag and Lead-lag compensator. Controller Design using Bode plots.

Unit V: Modern Control Theory

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, state diagrams, Block diagram representation of state equations, state space representation from ordinary differential equations, concepts of controllability and observability.

Laboratory Work:

Recommended Books:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw Hill International
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

Course No: ECE-13603

VLSI Technology

Unit I

Crystal growth and wafer preparation- Czochralski process apparatus-silicon shaping, slicing and polishing- Diffusion of impurities- physical mechanism- Fick'sI and II law of diffusion- Diffusion profiles- complementary (erfc) error function- Gaussian profile-Ion implantation- Annealing process-Oxidation process

Unit II

Lithography-Photolithography, Fine line Lithography, electron beam and x-ray lithography- Chemical vapour deposition (CVD)- epitaxial growth- reactors- metallization- patterning- wire bonding and packaging.
Monolithic components: monolithic diodes- schottky diodes and transistors- Isolation of components-junction isolation and dielectric isolation-Transistor fabrication- buried layer- impurity profile-parasitic effects

Unit III

FET structures- MOSFET- PMOS and NMOS, Basic Electrical Properties of MOS: Ids-Vds relationships, MOS transistor: threshold Voltage, gm, gds, figure of merit. MOS resistors and capacitors- MOS structures- IC crossovers and vias.
CMOS technology: Metal gate and silicon gate- oxide isolation- Twin well process- Latch up.

Unit IV

Digital design, Quality metrics of Digital Design. Review of CMOS, Simple logic circuits- inverter-CMOS Inverter analysis and design-Various pull ups, NAND and NOR gates, Adders, Multipliers, Parity generators, Comparators, Zero/One Detectors, Shift registers and Counters,

Unit V

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, CMOS Design rules for wires, Contacts and Transistors, Layout Diagrams for NMOS and CMOS Invertersand Gates, Choice of layers, Scaling of MOS circuits, Limitations of Scaling. Sheet Resistance RS and its concept to MOS, Area Capacitance Units, Calculations, Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out.

Books Recommended

1. VLSI technology: S M Sze, Mc Graw Hill pub.
2. Basic VLSI design: Douglas Pucknell, PHI.
3. Principles of CMOS VLSI Design: H E Weste, Pearson Edn.
4. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
5. Integrated Circuits: K R Botkar, Khanna Pub.
6. CMOS circuit design layout and simulation: Barter, IEEE press.
7. Introduction to VLSI: Conway, Addison weslay.

Course No: ECE-13604

Microwave Engineering

UNIT I

Limitations in microwave tubes: Lead inductance and Inter electrode capacitive effects, Transient angle effect, Gain bandwidth limitation, Study of microwave resonators: Analysis and operation of multicavity and reflex, Klystron, Admittance diagram of Klystron. Analysis and Operation of a traveling wave magnetron, principle of operation of Traveling Wave Tube.

UNIT II

Attenuators, Phase shifters. Matched Terminators, short circuit plunger, E-plane tee, H-plane tee, Magic tee, Hybrid rings. Directional Coupler, Two-hole directional coupler. Isolator, Circulator.

UNIT III

Classification of Microwave Devices, Tunnel Diode; Gunn Diode, two valley structures, mode of operation, circuit realization. PIN diode, basic principles of operationequivalentcircuit, and application as switch, modulator and Phase shifter, parametric amplifiers.

UNIT IV

Measurement of VSWR and Reflection coefficient, impedance using slotted line. Use of smith chart. Impedance matching, Double and triple stub tuners, Quarter wave Transformer.

UNIT V

Measurement of Frequency and Wavelength. Measurement of Microwave power-low, high, use of bolometer, use of calorimeter. Introduction to Strip lines: Micro strip and Parallel Strip Lines.

Books Recommended

1. Reich A J, “Microwave principles”, Van Nostrand, Affilated East-West press Pvt.Ltd., New Delhi.
2. Collin R E, “Fundamentals of Microwave Engineering”, McGraw-Hill.
3. Liao S Y, “Microwave Devices and Circuits”, Prentice hall of India.
4. Das A and Das S K, “Microwave Engineering” Tata McGraw-Hill PublishingCompany Limited, New Delhi.
5. K C Gupta, “Microwave”, New Age International, New Delhi.

ECE-13605

Power Electronics

Unit I: Power Devices

Review of switching characteristics of semiconductor devices *(Power diodes, BJT's,),* Characteristics of an ideal switch, Types of electronic switches, Thyristor construction and characteristics and specifications, Methods of turning ON, Turn-off mechanism, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, Brief introduction to GTO, IGBT, MCT, DIAC, TRIAC and UJT.

Unit II: Thyristor Circuits and Applications

Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with Resistive and Inductive loads, Modified bidirectional controllers. Concept of free-wheeling,

Unit III: Commutation Techniques

Commutation techniques: Natural commutation, Forced commutation, Self commutation, Impulse commutation, complementary commutation, External pulse commutation, Load side commutation, Load side commutation, Series and Parallel combination of SCRs.

Unit IV: Switch Mode DC to DC Power Converters

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Half-Bridge converter, Push Pull converter and Full Bridge converter.

Unit V: Inverters and Cyclo-converters

Inverter: Principle of operation, performance parameters, Pulse width modulation techniques,
Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down , design of single-phase step down Cyclo-converters Power supplies: SMPS, UPS.

Books Recommended:

1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.
3. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.
4. Introduction to Thyristors and their Applications, by M. Ramamorty .

ECE-13606L

Digital Communication Lab

1: To study various distribution functions

2: To study and observe waveforms of ASK, FSK, PSK and QPSK Modulation and demodulation.

3. To study the characteristics of second order Band pass filter

4. To study sampling and time division Multiplexing and de-multiplexing.

5. To study the characteristics of Gaussian noise and to measure its spectrum height in the frequency band over which its spectral density is flat.

6. To study delta modulation and demodulation.

7. To observe the time domain and spectral Characteristics of the waveform of BPSK, QPSK and offset-QPSK, to build modulators for them and measure their BER Performance with ideal receivers.

8. To implement the optimal receiver for 4- PAM and 16 QAM modulated signals, study the spectral characteristics of PAM, QAM and measure their BER performance.

9. Study of pulse code modulation (PCM) and demodulation.

10. Study of delta modulation and demodulation and observe the effect of slope overload.

11. study of pulse data coding techniques for NRZ formats.

12. Data decoding techniques for NRZ formats.

Course: ECE-13607L

Power Electronics & Control Engineering Lab.

1. Verify switching action of a Power BJT and MOSFET
2. IV characteristics of SCR
3. Calculation of Holding and latching currents of SCR.
4. IV characteristics of DIAC
5. IV characteristics of TRIAC
6. IV characteristics of UJT.
7. To study various Commutation Techniques.
8. To study controlled rectification (Half-wave and Full-Wave).
9. To study AC voltage controller.
10. Design of BUCK converter for given specifications.
11. Design of BOOST converter for given specifications.
12. Design of BUCK-BOOST converter for given specifications.
13. Study and verify effective transfer function of Blocks in Cascade and Parallel.
14. Time domain analysis of 1st and 2nd order system (Impulse and Step Response).
15. To study variation of response of a 2nd order system with damping factor.
16. Study and Design of PD controller for given specifications.
17. Study and Design of PI controller for given specifications.
18. Study and Design of PID controller for given specifications.
19. To study stability of a given system using Root Locus Plot.
20. To study stability of a given system using Polar Plot.
21. Computation of Gain Margin and Phase Margin for various systems.

Course: ECE- **13608L**

Microwave, Transmission Lines & and Antenna Lab

1: To study I-V characteristics of Gunn Diode
2. Study of Microwave components and Instruments
3. To study the characteristics of reflex Klystron
4. Tuning of Klystron Mechanical and Electronics Methods
5. To study the Characteristics of Crystal Detector.
6. To measure the Frequency using direct reading frequency meter and compare it with indirect frequency meter.
7. To measure VSWR, Insertion loss and attention of fixed and variable attenuator
8. Measurement of Directivity and Coupling coefficient of an directional coupler
9. To plot and study the V-I characteristics of a Gunn diode
10. To match impedance for maximum power transfer using a slide screw tuner
11. Calibration of the attenuation constant of an attenuator
12. Determination of a radiation Characteristics and gain of an antenna
13. Measurement of Q of a cavity by slotted line method.
14. To measure the characteristic Impedance of Transmission line.
15. To study open and short circuit condition of transmission line.
16. To study gain and radiation characteristics of various Antennas
17. To study characterizes of various antennas using CST tool.

SEMESTER 7th

Course No: ECE-13701

Data Communication and Computer Networks

Unit I: Introduction

Data representation and flow, Analog and Digital data, Analog and Digital signals, Periodic Analog Signals, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Data Communication modes, Transmission of Digital Signals, Transmission Impairment (Attenuation, Distortion, Noise), Data rate limits (Noiseless Channel: Nyquist Bit rate, Noise Channel: Shannon Capacity), Performance parameters.

Unit II: Data Transmission

Digital Transmission: Digital to Digital Conversion, analog to digital conversion, transmission modes), Analog Communication: Digital to Analog Conversion, Analog-to-Analog Conversion). Introduction to multiplexing and spectrum spreading.

Unit III: Transmission Media and Switching

OSI, TCP/IP and other networks models, Network Topologies, Network Types based on size like PAN, LAN, MAN, WAN, Functional Classification of Networks, Peer to Peer, Client Server. Transmission media Guided (UTP, STP, Coaxial and Fibre optic,), Unguided Media, switching and encoding, Requirements of computer networks, Introduction to Wireless Networks.

Unit IV: Data Link Layer

Design issues of Data Link layer, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window, Slip, Data link layer in HDLC, Contention based media access protocols (ALOHA, Slotted ALOHA, CSMA and CSMA/CD) MAC addresses.

Unit V: Network and Transport Layer

Introduction of network layer, IP addressing (IPV4 and IPV6), Classes of IP addressing, Sub-netting and Super-netting, Virtual circuit and Datagram Subnets-Routing algorithms (shortest path, Vector distance and Link state routing), Flooding, Congestion, Control avoidance algorithms, Introduction to Internetworking devices, Introduction to transport layer, Transport Services, Connection management, TCP and UDP protocol.

Books Recommended:

1. B. A. Forouzan, Data Communications and Networking, TMH.
2. William Stallings, Data and Computer Communications, Pearsons.
3. P. C. Gupta, Data Communication and Computer Networks, PHI.

Course No: ECE-13702

Power Systems

UNIT I

Introduction to Power System, Single line diagram, impedance and reactance diagram of a power system, Single Phase and Three Phase Transmission, Overhead and Underground Transmission System, Elements of AC distribution. Single fed, double fed and ring main distributor. Per unit Systems.

UNIT II

Mechanical Design of Transmission Lines: Main components of overhead lines, Conductor materials, Line supports, insulators, Types of insulators, Potential distribution over suspension insulators, String efficiency, Methods of improving string efficiency, Sag in overhead lines and sag calculations.

UNIT III:

Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, Capacitance calculation, losses and current carrying capacity.

UNIT IV:

Transmission line parameters, types of overhead conductors with calculations of inductance and capacitance, effect of earth on capacitance of a transmission line, Bundled conductors, Skin and proximity effect, corona, interference of power lines with communication lines.

UNIT V

Representation of lines, Modeling and Performance analysis of short, medium and long transmission lines. ABCD constants, Transposition of transmission conductors, Surge impedance loading, Ferranti effect.

Books Recommended:

1. J J Grainger and W D Stevension, “Power System Analysis”, McGrawHill,Inc., 1994.
2. D P Kothori and I J Nagrath, “Modern Power System Analysis”, Tata McGraw Hill Education Private Limited, 2011.
3. Hadi Saadat, “Power System Analysis” McGraw-Hill, 2004.
4. M A Pai,” Computer Techniques in Power System Analysis”, Tata McGraw Publishing Company Limited, 2006

Course No: ECE 13703

Microcontrollers and Embedded Systems

UNIT -I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT III: Introduction to Microcontrollers

Microcontrollers for embedded systems, Classes of microcontrollers, Types of Microcontrollers, Introduction to microcontrollers, platforms PIC, Arduino and 8051. Choosing a microcontroller for embedded application.

UNIT IV: 8051 Microcontroller Architecture

8051 microcontrollers, Architecture, Features, Pin layout, addressing modes, accessing memory using various addressing modes, Jump, Loop and call instructions, Time delay generation and calculation, Single bit instructions, Bit manipulation instructions, I/O port Programming.

UNIT V: Features and Programming

Architecture of 8051 timers, Counters and Interrupts, Programing 8051 timers, Counter programming (pulse, frequency and width measurements), Interrupt programming, Programming external hardware interrupts and serial communication interrupts, Microcontroller Interfacing - Key Board, D / A and A/D conversion, Stepper Motor.

Books Recommended

1. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", THM
2. Mohammad Ali mazidi," The 8051 Microcontroller and Embedded Systems, PHI
3. Kenneth J. Ayala," The 8051 Microcontroller", Cengage Learning.

ELECTIVE-I

Course No: ECE-13704E (A)

Optical Fiber Communication

Unit I: Optical Fiber: Structures and propagation
Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, different types of fibers, optical fiber modes and configurations, mode theory, attenuation, dispersion, characteristics of single mode fibers.

Unit II: Digital and Analog links
Point to point links, power links, error control, coherent detection, Differential Quadrature Phase Shift Keying (QPSK), overview of analog links, Carrier-to-Noise Ratio, multichannel transmission techniques, RF over fiber, radio over fiber links.

Unit III: WDM
Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, SONET/ SDH, high speed light wave links, optical Add/Drop multiplexing, optical switching, WDM examples.

Unit IV Optical Sources and Detectors
Optical sources- Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Reliability of LED&ILD, Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium.

Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photodetectors, Optical receiver operation.

Unit V: Optical Networks
Passive Optical Networks, IP over DWDM, Optical Ethernet Optical receiver operation-Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers. Optical system design Considerations, Component choice.

Books Recommended:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.
5. Fiber Optic Communication Systems–Govind.P.Agarwal , John Wiley, 3rd Edition, 2004.
6. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

Course No: ECE-13704E (B)

Speech and Audio Processing

Unit-I Fundamentals of Speech

The human speech production mechanism, LTI model for speech production, nature of the speech signal, linear time varying model, types of speech, voiced and unvoiced decision making, audio file formats: nature of WAV file, parameters of speech, spectral parameters of speech.

Unit-II Linear Prediction of Speech and Quantization

Lattice structure realization, forward linear prediction, auto correlation covariance method, uniform and non-uniform quantization of speech, waveform coding of speech, the 726 standard for ADPCM, parametric speech coding technique, RELP based vocoder, transform domain coding of speech, sub-band coding of speech.

Unit-III Speech Quantization and Coding

Uniform-Non-uniform quantizers and coder, companded quantizer, forward adaptive quantizers, Backward adaptive quantizers, waveform coding of speech, PCM,DPCM,ADM, Introduction to parametric speech coding techniques.

UNIT-IV Speech Synthesis

History of text-to-text speech system, synthesizer technologies. HMM based speech synthesis, sine wave synthesis, speech transformation, emotion recognition from speech, watermarking for authentication of a speech / Music signal, digital watermarking, watermarking in capestral domain.

Unit-V Speech Processing Applications

Speech Recognition Systems, Architecture of a large vocabulary continuous speech recognition system. Deterministic sequence recognition for ASR, statistical sequence recognition for ASR, VQHMM based speech recognition, speech enhancement, Adaptive echo cancellation.

Books Recommended:

1. Speech and Audio Processing, Dr Shaila D Apte, Wiley Publications.
2. Digital Signal Processing, Dr. Shaila D. Apte, Wiley Publications.
3. Theory and Applications of Signal Processing, L.R. Rabinder and B.Gold, Prentice Hall .
4. Digital Signal Processing A.V. Oppenheim and R.W Shafer, Prentice Hall 1985.
5. Introduction to Digital Signal Processing J.G. Proakis and DG Manolakis, Prentice Hall.

Course No: ECE-13704E (C)

HDL and Digital System Design

UNIT I: Hardware Description Languages and VHDL

Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioural, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes: Assignment, Logical, Arithmetic, Relational and concatenation operators

UNIT II: Concurrent, Sequential Codes and State

Machines Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, PROCESS, IF, ELSIF, WAIT, CASE, LOOP, Signal versus Variable, Bad Clocking, Brief concepts of Finite State Machines, (Melay and Moore Machines), state diagrams and state tables.

UNIT III: Combinational and Sequential Circuit Design

Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, De-multiplexers, encoders, decoders,code converters, comparators, Boolean functions using Multiplexer. Shannon's expansion theorem, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UPDOWN, Johnson and Ring Counters.

UNIT IV: System Design

Introduction to COMPONENTS and FUNCTIONS, Port Mapping, Digital system design: VHDL modeling of ALU, Pseudo random Number Generator, Sequence detector, Barrel shifter,

UNIT V: Programmable Logic devices

Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices (CPLD) and Field Programmable Logic Arrays(FPGA), Advantages of FPGAs, Application Specific integrated Circuits (ASIC), FPGA design flow.

Books Recommended:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Perry D. L., VHDL Programming by Example, TMH,2000.
4. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
5. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design, TMH.2008.

Course No: ECE-13704E (D)

Advanced Microprocessors

Unit I: Intel 8086, 80186

Architecture and working of 8086 and 80186 Microprocessor, Register set of 8086 and 80186 Microprocessor, Addressing Modes and memory segmentation in 8086 and 80186 microprocessor.
Differences between 8086 and 80186 microprocessors, Instruction set of 8086 Microprocessor, Assembly language Programming for 8086 microprocessors.

Unit II Intel 80286 Processor Architecture and Programming
Intel 80286 Microprocessor, 80286 Architecture, system connection – Real and Protected mode operations. Memory management unit, OS support, Instruction for Real and Protected mode operations.

Unit III: Intel 80386 Processor: Architecture and Programming
Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection – call gates – I/O privilege levels – Interrupts and exception handling – task switching – paging mode – 80386 virtual 86 mode operation.

Unit IV: Intel 80486 and Pentium Processors: Architecture and Programming
80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode, Recent trends in microprocessor design. Pentium – super scalar architecture – u-v pipe line – branch prediction logic – cache structure – BIST (built in selftest) – Introduction to MMX technology.

Unit V: Advanced and Special Purpose Processors
Architecture, addressing and programming of Digital Signal Processors, co-processors and I/O processors. Difference between CISC and RISC processors, various emerging trends in Microprocessor Design. Introduction to graphics and other special purpose processors, Introduction to architecture of multi-core processors.

Books Recommended:
1. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company
2. Advanced Microprocessors by Daniel Tabak McGraw-Hill.
3. Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.
4. Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education
5. Advanced Microprocessors by Y. Rajasree, New Age International.

Course No: ECE-13704E (E)

Radar and Satellite Communication

Unit-I Modern Radar System
Fundamentals of surveillance Radar and design: Bandwidth considerations, Prf, Un-ambiguious range and velocity, Pulse length and sampling, radar Cross-section and Clutter. Tracking Radar, Tracking and search radars. Antenna beam shapes required, radar guidance, Frequency agility, Importance of Mono Pulse radar.

Unit-II Satellite Communication
Basic Transmission Theory, System Noise Temperature and G/T ratio, Design of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design of Satellite Link for Specified (C/N)

Unit-III Multiple Access Techniques
Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access with on Board Processing VSAT.

UNIT-IV Satellite Channel and Link Design
Basic information theory, General link design equation, Noise Temperature, Calculation of Systems, Noise Temperature, Noise Figure and Noise Temperature, Antenna Noise Temperature, Noise Density, G/T, Ratio for Earth Systems, uplink Design Downlink Design.

Unit-V Satellite Applications
Satellite for earth observation, Satellite for weather forecast, Satellite for Scientific studies. Satellite for Military Applications, Satellite Television, Telephone services via satellite, Global Positioning System (GPS).

Books Recommended:

1. J.G Proakis, " Digital Communication" MGH 4th edition
2. Edward A. Lee and David G. Messerschmitt, " Digital Communication", allied Publishers.
3. J Marvin. K.Simon, Sami M. Hinedi and William C. Lindsey " Digital Communication" .

Course No: ECE-13705L

Data Communication and Computer Networking Lab

1. Study of different types of network cables and practically implement the cross and straight wire.
2. Study the basic network commands and network configuration commands.
3. Experiments of resource sharing (Remote Desktop Sharing, Drive Mapping etc).
4. Experiments on creation of LAN's and WAN's using Packet Tracer software.
5. To study the various internetworking devices using Packet Tracer.
6. Configuration of Network Operating System for DCHP, FTP, Telnet and Active Directory.
7. User management using Active Directory.
8. Creation of Virtual LAN's and DHCP using packet Tracer Software.
9. To configure the Wireless LAN's.
10. Implementation of Adhoc and Infrastructure Networks.

Course No: ECE-13706L

Microcontrollers and Embedded Systems LAB

1. Study A/D Converter and Analysis of External input using A/D converter and Display the result on LCD.
2. Study D/A Converter, Waveform generation i.e. ramp wave, step wave, square wave, triangular wave.
3. Display the status of 4-bit Keyboard switches on LCD and interface the LCD with micro-controller to display data or character string.
4. Study the 7-segments Display, Digital clock, counter (0-9) and (0-99).
5. Study the LEDs, check the status of any ports, add two numbers and display the result on LEDs, multiply the two numbers and display the result on LEDs.
6. Study the Relay Switch and perform switching of relays to turn ON/OFF.
7. Study the Buzzer operation by using the micro-controller.
8. Study the stepper motor.
9. Some Experiments on Arduino Module.

Course No: ECE-13707P

PRE-PROJECT

The students are required to undergo training at some center of excellence outside the state to get additional exposure in the new and emerging trends in the discipline of Electronics and communication engineering. This component shall be evaluated by the host Institute through conduct of theory and practical examinations in collaboration with the teacher in-charge of the Department.

Course No: ECE-13708S

SEMINAR

Each student shall present a seminar in the 7th semester on a topic relevant to Electronics and Communication Engineering for about 30 minutes. The topic should not be a replica of what is contained in the syllabus. The topic shall be approved by the Seminar Evaluation Committee of the Department. The committee shall evaluate the presentation of students. Seminar report in the prescribed form shall be submitted to the department after the approval from the committee.

Course No: ECE-13801

Wireless Communications

Unit 1: THE WIRELESS CHANNEL

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels.

Unit II: MULTIANTENNA COMMUNICATION:

Realization of Independent Fading Paths – Receiver Diversity – Selection Combing – Threshold Combing – Maximal-Ratio Combing – Equal - Gain Combing – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme– Transmit & Receive Diversity-MIMO Systems**.**

Unit III: CELLULAR CONCEPTS:

Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service(GOS) Improving coverage & capacity in cellular Systems-Cell Splitting- Sectoring-Repeaters for Range Extension-Microcell Zone Concept**.**

Unit IV: HAND OFF AND CHANNEL PREDICTION MODELS:

Why hand-off, types of handoff, forced handoffs: controlling a handoff, creating a handoff, queing of handoffs, power difference handoffs, Mobile Assisted Handoff (MAHO) and soft handoff, introduction to Dropped Call rate, Tele-traffic theory, Prediction models (Okumura, Hata and Log-normal shadowing model).

Unit V: CELLULAR SYSTEM ARCHITECTURES:

Multiple access techniques used in mobile wireless communications: FDMA/TDMA, CDMA. FDM/TDM Cellular systems, Cellular CDMA, soft capacity, Earlang capacity comparison of FDM/TDM systems and Cellular CDMA. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling, Frequency allocation and control, Base System and Master System, introduction to 3G and 4G mobile communication.

Books Recommended:

1. David TSE and Pramod Viswanath "Fundamentals of Wireless Communication" Willey series in Telecommunication, Cambridge university press, 2005.
2. Theodore S. Rappaport "Wireless Communication principles and practice", 2nd Edition Pearsons Education, Indial 2009.
3. Arogyaswami Paulraj, Rok Nambar Dhananjay Gore "Introduction to space-time wireless communication' 1st edition, Cambridge university press, 2008.
4. W.C.Y Lee " Mobile Cellular Telecommunications-Analog and Digital Systems, 2nd edition Tata Mcgraw-Hill 2006.
5. Andrea Goldsmiths " Wireless Communication" Cambridge University Press 2005.

Course No: ECE-13802

Industrial Organization and Management

UNIT I

Modern concept of Management: Scientific Management-Functions of Management-Planning -Organizing-Staffing–Directing–Motivating-Communicating-Co-coordinating-Controlling-Organizational structures- Line, Line and staff and Functional relationships- Span of control Delegation-Management by Objectives.

UNIT II

Personnel management: Objectives and functions of personnel management- Recruitment Selection and training of workers- Labor Welfare- Industrial Fatigue- Industrial Disputes-Trade Unions - Quality circles. Formation of companies: Proprietary-Partnership-Joint stock companies Public-sector- Joint sector and Co-operative sector.

UNIT III

Marketing Management: Pricing- Promotion- Channels of distribution- Market Research Advertising. Production Management: Batch and mass production- Inventory control- EOQ-Project planning by PERT/CPM- Construction of Network (Basic ideas only).

UNIT IV

Theory of demand and supply- Price mechanism- Factors of production- Land, labor, capital and organization- National income- Difficulties in estimation- Taxation- Direct and indirect taxes Progressive and regressive- Black money- Inflation-Causes and consequences.

UNIT V

Indian financial system- Reserve bank of India: Functions - Commercial banking system Development financial institutions - IDBI- ICICI- SIDBI- IRBI- NABARD- Investment institutions –UTI - Insurance companies - Indian capital market- Stock market- Functions- Role of the public sector - Privatization- Multinational corporations and their impact on the Indian economy.

Books Recommended:

1. Industrial Management by O P Khanna, Dhanpat Rai Pub.
2. Industrial Management by K.K. Ahuja, Khanna Pub.
3. Marketing Management by Philip Kotler, PHI
4. Indian economy by A.N. Agarwal, Wishwa Prakashan
5. Modern economic theory by K.K Dewett, Shyam Lal charitable trust.

ELECTIVE-II

Course No: ECE-13803E(A)

CMOS Circuit Design: Analog & Mixed

Unit I: MOSFET Operation

MOS Capacitor, MOSFET I-V characteristics, Regions of operation, sub-threshold characteristics, MOSFET channel mobility, MOSFET capacitance and inversion layer capacitance effect, MOSFET parasitic elements. MOS transistor with Ion-Implanted channels, Threshold Voltage: Threshold variation with device length and width and temperature dependence of threshold voltage. Short channel effects: Channel length modulation, barrier lowering, two dimensional charge sharing and threshold voltage, Punch Through, Carrier velocity saturation, Hot carrier effect-substrate current, gate current and breakdown, effect of surface and drain series resistance, effects due to thin oxides and high doping.

Unit II: Analog CMOS Sub circuits

MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources, Trans linear Circuits: Ideal Trans linear Element, Trans linear-loop-circuit synthesis, Various Trans linear circuits, Squarer/divider, Squarer rooting, Current Mirrors, The Basic Current Mirror, Cascoding the Current Mirror, Biasing Circuits

Unit III: Amplifiers

Amplifiers, Gate-Drain Connected Loads, Current Source Loads, Common-Source Amplifier, The Cascode Amplifier, The Common-Gate Amplifier, The Source Follower (Common-Drain

Amplifier), The Push-Pull Amplifier, Differential Amplifiers, The Source-Coupled Pair, The Source Cross-Coupled Pair, Cascode Loads, The Gilbert Cell.

Unit IV: References, Multistage Amplifiers and Nonlinear Circuits

Voltage and Current References, MOSFET-Resistor Voltage References, Parasitic Diode-Based References, Bandgap Reference Design, Operational Amplifiers, The Two-Stage Op-Amp, The Operational Trans conductance Amplifier (OTA), Basic CMOS Comparator Design, MOS Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, Modulation and Demodulation using Analog Multipliers.

Unit V: Data Converters

Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators.

Books Recommended

1. P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, Analysis and Design of analog integrated circuits, John Wiley and Sons, 2001.
2. R. Jacob Baker, CMOS, Circuit Design, Layout, and Simulation, JOHN WILEY & SONS, 2010.
3. P. E. Allen and D. R. Holberg, CMOS analog circuit design, Oxford University Press, 2002.

Course No: ECE 13803E(B)

Digital Image Processing

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Various Pixel manipulation operations using MATLAB. Review of Image transforms: 2D-DFT, FFT.

Unit II: Image Enhancement

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering.

Unit III: Image Enhancement

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations.

Unit IV: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG and MPEG.

Unit V: Image Processing using MATLAB

Introduction to Image Processing Toolbox. Frequently used commands in image processing. Reading and writing of images. Resizing an image, Image filtering and restoration using MATLAB. Image compression using MATLAB.

Books Recommended

1. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
2. Anil K. Jain “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly “The Data compression Book”, Bpb Publications.
4. Pratt William “Digital Image Processing”, John Wiley & sons.
5. Chanda & Majumdar, “Digital Image Processing and Analysis”, PHI.

Course No: ECE-13803E(C)

Data Structures

Unit 1: Lists, Stacks

Lists, Abstract Data Type-List, Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked - Implementation and Applications. Stacks, Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Applications.

Unit II: Queues

Abstract Data Type-Queue, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of DEQUEUE, Array Implementation of a dequeuer, Linked List Implementation of a dequeuer.

Unit III: Trees

Trees, Abstract Data Type-Tree, Tree Traversals, Binary Trees, Binary Tree Traversals, Recursive Binary Tree Traversals, Non Recursive Binary Tree Traversals, Applications. Binary Search Trees, Traversing a Binary Search Trees, Insertion of a node into a Binary Search Tree, Deletion of a node from a Binary Search Tree, AVL Trees, Insertion of a node into an AVL Tree, Deletion of a node from and AVL Tree, AVL tree rotations, Applications of AVL Trees, B-Trees, Operations on B-Trees, Applications of B-Trees.

Unit IV: Graphs
Graphs Definitions, Shortest Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge costs, Acyclic Graphs, All Pairs Shortest Paths Algorithm, Minimum cost Spanning Trees, Kruskal's Algorithm, Prims's Algorithm, Applications, Breadth First Search, Depth First Search, Finding Strongly Connected Components.

Unit V: Searching, Sorting and Advanced Data Structures
Linear Search, Binary Search, Applications. Internal Sorting, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sot, Heap Sort, Sorting on Several Keys. Splay Trees, Splaying steps, Splaying Algorithm,Red-Black trees, Properties of a Red Black tree, Insertion into a Red-Black tree, Deletion from a Red-Black tree, AA-Trees.

Books Recommended:

1. Tenenbaum, Data Structures through C
2. Weiss, Data Structures and Algorithms in C++
3. Samiran Chattopadhy, Data Structures through C Language
4. Patel, Data Structures with C
5. Wiener and Pinson, Fundamentals of OOPS and Data Structures in Java

Course No: ECE-13803E(D)

Industrial Automation & Control

Unit I
Introduction: Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations. Flow lines & Transfer Mechanisms, Fundamentals of Transfer Lines.

Unit II
Material handling and Identification Technologies: Overview of Material Handling systems, Principles and Design Consideration, Material Transport Systems, Storage Systems, Overview of Automatic Identification Methods.

Unit III
Automated Manufacturing Systems: Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMS and its Planning and Implementation. Quality Control Systems: Traditional and Modern Quality Control Methods, SPC Tools, Inspection Principles and Practices, Inspection Technologies.

Unit IV

Control Technologies in Automation: Industrial Control Systems, Process Industries Versus Discrete-Manufacturing Industries, Continuous Versus Discrete Control, Computer Process and its Forms.

Unit V

Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation Systems: LAN, Analog & Digital I/O Modules, SCADA Systems& RTU. Distributed Control System: Functional Requirements, Configurations & some popular Distributed Control Systems.

Books Recommended:

1. Automation, Production Systems and Computer Integrated Manufacturing M.P. Groover, Pearson Education.5th edition, 2009.
2. Computer Based Industrial Control- Krishna Kant, EEE-PHI,2nd edition,2010.
3. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk.

Course No: ECE-13803E(E)

MECHATRONICS

UNIT I

Rotational drives - Pneumatic Motors: continuous and limited rotation - Hydraulic Motors: continuous and limited rotation - Brushless DC Motors - Motion convertors, Fixed ratio, invariant motion profile, variators, remotely controlled couplings Hydraulic Circuits and Pneumatic Circuits.

UNIT II

Mechanical Systems and Design - Mechatronic approach - Control program control, adaptive control and distributed systems - Design process - Types of Design - Integrated product design - Mechanisms, load conditions, design and flexibility Structures, load conditions, flexibility and environmental isolation – Man machine interface, industrial design and ergonomics, information transfer from machine from machine to man and man to machine, safety.

UNIT III

Real time interfacing - Introduction Elements of data acquisition and control Overview of I/O process - Installation of I/O card and software - Installation of application software-Overframing.

UNIT IV

Case studies on Data Acquisition - Testing of transportation bridge surface materials - Transducer calibration system for Automotive applications Strain Gauge weighing system – Solenoid force - Displacement calibration system - Rotary optical encoder - Inverted pendulum control - Controlling temperature of a hot/cold reservoir - Pick and place robot - Carpark barriers.

UNIT V
Case studies on Data Acquisition and Control - Thermal cycle fatigue of a ceramic plate – pH control system - De-Icing Temperature Control System - Skip control of a CD Player – Autofocus Camera, exposure control. Case studies on design of Mechatronic products - Motion control using D.C. Motor, A.C. Motor & Solenoids - Car engine management - Barcode reader.

Books Recommended

1. Bolton, -Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering-2nd Edition, Addison Wesley Longman Ltd., 1999.
2. Devdas shetty, Richard A. Kolk, -Mechatronics System Design,- PWS Publishing company, 1997.
3. Bradley, D.Dawson, N.C. Burd and A.J. Loader, Mechatronics: Electronics in Products and Processes, Chapman and Hall, London, 1991.
4. Brian Morris, Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics, Mc Graw Hill International Edition, 1995.
5. Gopel Sensors A comprehensive Survey Vol I & Vol VIII, BCH Publisher, New-York.

Elective-III

Course No: ECE-13804E(A)

Neural Network and Fuzzy Logic

Unit I
Fuzzy Logic: Basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations on Fuzzy sets, fuzzy numbers and intervals, Arithmetic on fuzzy sets, Fuzzy Relations, Fuzzification, Approximate reasoning, Fuzzy control and Expert systems, Fuzzy if-then rules, Variables inference techniques, Defuzzification techniques, Basic Fuzzy interference algorithm, application of fuzzy logic , Fuzzy system design implementation, useful tools supporting design.

Unit II

Neural Networks Characteristics**:** History of Development in neural networks, Artificial neural net terminology, model of a neuron, Topology, ANN architecture, Types of learning. Supervised, Unsupervised learning, Basic Learning laws.

Unit III

Basic Learning laws, Hebb's rule, Delta rule, window and Hoff LMS learning rule, correlation learning rule instar and ouster learning rules.

Unit IV

Unsupervised Learning: Competitive learning, K-means clustering algorithm, Kohonen's feature maps. Radial Basis function neural networks - recurrent networks, Real time recurrent and earning algorithm.

Unit V

Introduction to Counter Propagation Networks**-** CMAC Network, ART networks, Application of NN in pattern recognition, optimization, Control, Speech and decision making.

Books Recommended:

1. Berkin Riza C and Trubatch, " Fuzzy System design principles- Building Fuzzy IFTHEN rule bases", 2. Yegna Narayanan, "Artificial Neural Networks". 8th Printing. PHI (2003)
3. Patterson Dan W, "Introduction to artificial Intelligence and Expert systems", 3rd Ed., PHI
4. Simon Haykin, "Neural Networks" Pearson Education.
5. Yen and Langari, "Fuzzy Logic: Intelligence, Control and Information", Pearson Education.

Course No: ECE-13804E(B)

RF Engineering

UNIT I

Scattering and chain scattering matrices, Generalized scattering matrix, Analysis of two port networks, Interconnection of networks. Positive real concepts, scattering matrix, representation of microwave components (directional coupler, circulators, hybrids and isolators).

UNIT II

Tuned Circuits, Filter design- Butterworth filter, Chebyshev filter, impedance matching. High frequency amplifier, BJT and FET amplifier, Broadband Amplifiers RF Oscillators, Colpitts, Hartley Oscillators, PLL. High Frequency Integrated Circuits.

UNIT III

Types of amplifiers, Power gain equations. Introduction to narrow band amplifiers basic concepts, Maximum gain design, Low noise design. High power design, Negative resistance, reflection amplifiers – various kinds – stability considerations, Microwave transistor amplifier design – input and output matching networks – constant noise figure circuits.

UNIT IV

One port and two port negative resistance oscillators. Oscillator configurations, Oscillator design using large signal measurements, Introduction to Microwave CAD packages, Microwave integrated circuits, MIC design for lumped elements.

UNIT V

Radiation from surface current and line current distribution, Basic Antenna parameters, Feeding structure-Patch Antenna, Ring Antenna, Micro strip dipole, Micro strip arrays, Traveling wave Antenna, Antenna System for Mobile Radio-Antenna Measurements and Instrumentation. Propagation characteristics of RF and Microwave signals, Introduction to EBG structures.

Books Recommended:

1. Mathew M. Radmanesh, "RF and Microwave Design Essentials" Author House Bloomington 2007
2. Daniel Doskin " R.F. Engineering for Wireless Networks" Elsovier, London 2005.
3. Reinhald Ludwig and Gene Bogdarov " R.F, Circuit Design, Theory and Applications" 2nd Edition, Pearson, 2012
4. E.daSilva "High Frequency and Microwave Engineering" Butterworth Heinmann Publications, oxford 2001.
5. David M.Pozar " Microwave Engineering John Wiley and Sons" Third Edition, 2005.

Course No: ECE-13804E(C)

Information Security

Unit I: Information security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers,

Unit II Cryptanalysis.

Data scrambling and descrambling Cryptanalysis of classical ciphers. Introduction to modular arithmetic. Differential and linear cryptanalysis.

Unit III: Cryptographic Algorithms
Introduction to Data encryption standard, Security of DES, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Geffe generator, Stop and Go generator

Unit IV: Information Hiding for covert communications
Need of information hiding, Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains. Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Unit V: Practicals using MATLAB
Introduction to image processing toolbox. Frequently used commands for image manipulation (IMSHOW, IMREAD, IMWRITE, RAND, RANDN, RANDPERM etc.), Image encryption using MATLAB. Implementation of LSB and ISB algorithms, Frequency domain data hiding in MATLAB.

Books Recommended:

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", Prentice-Hall, New Jersey, 1999.
2. B. Schneier , “Applied Cryptography", John Willey & Sons, Inc., 2nd edition, 1996.
3. Lu, S.: Multimedia security: Stenography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Course No. ECE 13804E(D)

ROBOTICS

UNIT I
Robotics: Introduction- Robotic Mechanism - Classification of Robots - Drive Systems Robots - Co-ordinate system - Degrees of Freedom Spatial Descriptions -Transformations Position and orientation - Description of Frames - Mapping involving frames - Transform equations.

UNIT II
Kinematics of Manipulators Link Parameters Link frame assignment and forward kinematics Inverse manipulator kinematics Velocities and static forces Velocity Transformation Force control system Interfacing computers to Robots RS 232 Interface Hardware Handshaking Software
Handshaking RS 232 communication.

UNIT III

Machine Vision: Introduction Image Geometry Coordinate Systems Sampling and Quantization Image Definitions Levels of Computation Point Level Local Level Global Level Object Level, Binary Image Processing Thresholding, Geometric properties Size Position Orientation Projections Binary Algorithms Morphological Operators Basic Lighting Techniques.

UNIT IV

Optics - Lens Equation Image Resolution Depth of Field View Volume Exposure Shading Image radiance Surface orientation Reflectance Map Shape from Processing Color constancy: Statistical methods of Texture analysis- Structural analysis of Ordered Texture Model based methods for Texture Analysis Shape from Texture Depth stereo imaging Stereo Matching Shape from X-Range
Imaging Active Vision.

UNIT V

Dynamic Vision Change Detection Segmentation using motion Motion Correspondence Image flow Segmentation using a moving camera Tracking Shape from motion Object recognition System components Complexity of Object Recognition Object Representation Feature Detection Recognition Strategies Verification.

Books Recommended:

1. P.A.Jananki Raman, " Robotics and Image Processing " , Tata McGraw Hill 1991.
2. Ramesh Jain, Rangachar Kasturi, Brian G.Schunck, Machine Vision, Mc Graw Hill International Edition, 1995.
3. K.S.Fu, R.C. Gonzalez, C.S.G.Lee," Robotics Control, Sensing, Vision, and Intelligence, McGraw-Hill Incs., 1987.
4. Mikell P. Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G.Odrey
5. Industrial Robotics Technology, Programming and Applications, McGraw- Hill International Editions, 1986.
6. Awcock and R.Thomas, "Applied Image Processing ", McGraw Hill, Inc, 1996.
7. Rembold, " Microsystem Technology and Micro Robotics " Springer Ferlog

Course No: ECE-13804E(E)

Multimedia Systems

Unit I: Introduction to Multimedia Systems and Processing

Introduction to multimedia systems, Multimedia signals, various sources of multimedia signals, Motivation for growth of multimedia theory, different elements of multimedia communication system, Challenges involved with multimedia signal processing and communication

Unit II: Lossless Image Compression

Redundant information in images. Lossless and lossy image compression. Elements of an image compression system, Huffman coding. Limitations of Huffman coding. Arithmetic coding(Basic principal). Encoding and Decoding procedure of a n arithmetic coded bitstream. Coding limitations of arithmetic coding. Introduction to Lempel-Ziv and Run length coding

Unit III: Lossy Image Compression

Theory of Quantization, uniform and non-uniform quantization, scalar and vector quantization. Lloyd-Max quantizer. Rate-distortion function,Lossy predictive coding. Pixel encoding using Delta modulation, source coding theorem.

Unit IV: Multi-resolution Analysis: Theory of Sub band Coding

Subband coding and decoding of one-dimensional signals. Analysis and synthesis filters. Downsampling and upsampling. Subband coding for a two-dimensional four-band filter bank. Introduction to Discrete Wavelet Transforms (DWT) and its inverse. Calculation of DWT and inverse DWT through subband coding and decoding. DWT-based still image compression and coding system. Introduction to embedded wavelet coding.

Unit V: Multimedia Information Hiding

Need of information hiding, Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains. Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Books Recommended:

1. Gonzalez and Woods, "Digital Image Processing", 2 Ed, Pearson Education, 2002.
2. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly "The Data compression Book" 2 Ed, bpb Publications.
4. Lu, S.: Multimedia security: Stegnography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Course No: ECE-13805L

Wireless Communication and Information Security Lab

Study of wireless Communication using communication trainer kits

1.a. Baseband Communication.

1.b Adaptive Linear Equalizer.

1.c Code Division Multiple Access (CDMA)-Multipath.

1.d Global System Communication (GSM).

1.e Global Positioning System (GPS).

1.f Spread Spectrum Modulation.

Wireless Pathloss Computation-Study of Propagation Path Loss Models-indoor and outdoor (using Matlab) Programming:

2.a Free space Propagation-path labs Model
2.b Link Budget Equation for Satellite Communication
2.c Carrier to Noise Ratio in Satellite Communication
2.d Outdoor Propagation-Okumura Model
2.e Outdoor Propagation-Hata Model
3.f Study of various cryptographic techniques and for security Algorithms using MATLAB

Course No: ECE-13806P

PROJECT

This project work is the continuation of the project initiated in 6th semester. Each student group should complete the project work in this semester. Each student is expected to prepare a report and a technical paper in the prescribed format, based on the project work. The paper may be prepared as per IEEE standard and can have a maximum of eight pages. Members of the group will present the relevance, design, implementation, and results of the project before an evaluation committee consisting of the guide, and three/four faculty members of the department. The evaluation committee may also carry out continuous assessment of the project through progress seminars conducted during the semester.

Course No: ECE-13807T

INDUSTRIAL TRAINING

The students are required to undergo training at some center of excellence outside the state to get additional exposure in the new and emerging trends in the discipline of Electronics and communication engineering. This component shall be evaluated by the host Institute through conduct of theory and practical examinations in collaboration with the teacher in-charge of the Department.