Revised Course Structure 2015-16

DEPARTMENT OF Electronics And Communication Engineering

SCHOOL OF ENGINEERING AND TECHNOLOGY,NU.

Basic courses– 49 Credits
Core courses– 125 Credits
Electives courses-12 Credits
Total Credits for the Entire Course – 186 Credits

ANNEXTURE-I

NAGALAND UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Course Structure

Semester1 and Semester2 are common for all Branches and is given separately

Semester 3

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC3T01	Network Theory	4	3	1	-
2	EC3T02	Electronic Devices & Circuits	3	3	-	-
3	EC3T03	Digital Electronics & Logic Design	4	3	1	-
4	EC3T04	Signals and Systems	4	3	1	-
5	**IT3T3**	**Data Structures & Algorithm**	**3**	**3**	**-**	**-**
6	MAT3T1	Mathematics-III	4	3	1	-
PRACTICAL						
7	EC3L01	Electronic Devices & Circuits Lab	1	-	-	2
8	EC3L02	Digital Electronics & Logic Design Lab	1	-	-	2
9	EC3L03	Data Structures Lab	1	-	-	2
		Total Credits	**25**			

Semester 4

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC4T01	Control Engineering	4	3	1	-
2	EC4T02	Electromagnetic Field Theory	4	3	1	-
3	EC4T03	Microprocessor	4	3	1	-
4	**EC4T04**	**Linear Integrated Circuits**	**3**	**3**	**-**	**-**
5	EC4T05	Electronic Measurements & Instrumentation	3	3	-	-
6	**MAT4T1**	**Mathematics –IV**	**4**	**3**	**1**	**-**
PRACTICAL						
7	EC4L01	Microprocessor Lab	1	-	-	2
8	EC4L02	Linear Integrated Circuits Lab	1	-	-	2
		Total Credits	**24**			

Semester 5

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC5T01	Antenna & Wave Propagation	4	3	1	-
2	EC5T02	Digital System Design	3	3	-	-
3	EC5T03	Analog Communication	4	3	1	-
4	EC5T04	Microcontroller	3	3	-	-
5	**EC5T05**	**Information Theory & Coding**	**4**	**3**	**1**	**-**
6	**EC5T06**	**Management & Entrepreneurship**	**3**	**3**	**-**	**-**
PRACTICAL						
7	EC5L01	Microcontroller Lab	1	-	-	2
8	EC5L02	Digital System Design Lab	1	-	-	2
		Total Credits	**23**			

Semester 6

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC6T01	Digital Communication	4	3	1	-
2	EC6T02	Microwave Engineering	3	3	-	**-**
3	EC6T03	VLSI Technology	3	3	-	-
4	EC6T04	Power Electronics	3	3	-	-
5	**EC6T05**	**Microelectronics Circuits**	**3**	**3**	**-**	**-**
6	**EC6T06**	**Digital Switching System**	**3**	**3**	**-**	**-**
PRACTICAL						
7	EC6L01	Communication Systems Engineering Lab	1	-	-	2
8	EC6L02	Power Electronic Lab	1	-	-	2
		Total Credits	**21**			
Summer training						
		Industrial Training*	-	-	-	1

*4 – 6 weeks training will be held after 6th semester. However, viva-voce will be conducted in the 7th semester and the credit will be added as a part of the colloquium.

Semester 7

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC7T01	Computer Communication Networks	3	3	-	-
2	EC7T02	Digital Signal Processing	4	3	1	-
3	**EC7T03**	**Wireless Communication**	**4**	**3**	**1**	**-**
4	EC7EL1/2/3	Elective I	3	3	-	-
5	**EC7EL4/5/6**	**Elective II**	**3**	**3**	**-**	**-**
PRACTICAL						
6	EC7SM	Colloquium*	1	-	-	1
7	EC7L01	Microwave Engineering Lab	1	-	-	2
8	**EC7L02**	**Digital Signal Processing Lab**	**1**	**-**	**-**	**2**
9	**EC7PJ**	**Project****	**4**			
		Total Credits	**24**			

*****the student will submit a synopsis for their seminars on any technical topic at the beginning of the semester in a specified format which should be approved by the departmental committee. The student will also have to present the progress of their project through seminars and progress reports.

**The student will have to submit a synopsis and do the literature survey for their major project in this semester .

Elective I and II

Subject code	Course Name	Credits	L	T	P
EC7EL1	Embedded System and Design	3	3	-	-
EC7EL2	Operating Systems	3	3	-	-
EC7EL3	Optical Fiber Communication	3	3	-	-
EC7EL4	Multimedia Communication	3	3	-	-
EC7EL5	Body Area Network	3	3	-	-
EC7EL6	GSM	3	3	-	-

Semester 8

Sl. No	*Subject Code*	*Course name*	*Credits*	*L*	*T*	*P*
THEORY						
1	EC8T01	Biomedical Instrumentation	3	3	-	-
2	EC8T02	Digital Image Processing	3	3	-	-
3	EC8EL7/8/9	Elective III	3	3	-	-
4	**EC8EL10/11/12**	**Elective IV**	**3**	**3**	**-**	**-**
PRACTICAL						
5	EC8PJ	**Project**	8	-	-	16
		Total Credits	**20**			

.**Elective III and IV**

Subject code	Course Name	Credits	L	T	P
THEORY					
EC8EL7	Medical Imaging System	3	3	-	-
EC8EL8	Wireless Sensor Network	3	3	-	-
EC8EL9	Nano Technology	3	3	-	-
EC8EL10	Ad Hoc Wireless Networks	3	3	-	-
EC8EL11	Network Security	3	3	-	-
EC8EL12	Fundamentals of MEMS	3	3	-	-

ANNEXTURE –II

NAGALAND UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3T01	Network Theory	4	3	1	-

Unit I:Basics of Circuit Analysis
Kirchoff's laws, DC and AC excitation, Series and parallel circuits, Sinusoidal steady state analysis, Mesh current and node voltage method of analysis, Matrix method of analysis.

Unit II: Network Theorems
Thevenin's and Norton's theorems, Super position theorem, Compensation theorem, Reciprocity theorem, Maximum power transfer theorem, MilIman's theorem, Tellegen's theorem.

Unit III: Resonance And Coupled Circuits
Series and parallel resonance, Quality factor and Bandwidth, Multi resonance circuits, Coupling co-efficient, Frequency response and bandwidth, Tuned circuit.

Unit IV: Transients
Transient response of RL, RC and RLC circuits to DC excitation, Natural and forced oscillations.

Unit V: Duality And Topology
Concept of duality, Dual network, Graphs of a network, Trees, Chords and branches, Tie set and cutset of a graph, Application to network analysis.

Textbooks:
1. William H Hayt and Jack E. Kemmerly, " Engineering Circuit Analysis, Tata Mcgraw Hill International Edition, 1993.
2. Joseph Edminister and Mahmood Nahri. " Electric Circuits ", Third Edition, Tata McGraw Hill, Ne'rF Delhi, 1999.

References:
1. Soni ML. & Gupta .J. C, "A Course in Electrical Circuit Analysis ". Dhanpath Rai and Sons, New Delhi. 1981.
2. Paranjothi S.R .. " Electric Circuit Analysis, New Age International Ltd.New Delhi, 1996.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3T02	Electronic Devices & Circuits	3	3	-	-

UNIT 1:Diode Circuits

Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers.

UNIT 2:Transistor Biasing

Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization.

UNIT 3:Transistor at Low Frequencies

BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits re model; analysis of CE configuration using h- parameter model; Relationship between h parameter model of CE, CC and CE configuration.

UNIT 4:Transistor Frequency Response

General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects.

UNIT 5:(a) General Amplifiers

Cascade connections, Cascade connections, Darlington connections.

(b) Feedback Amplifier

Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers.

UNIT 6:Power Amplifiers

Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers.

UNIT 7:Oscillators

Oscillator operation, Phase shift Oscillator, Wien bridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators.

UNIT 8:FET Amplifiers

FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

Textbooks :

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill.
2. David A.Bell, " Electronic Devices and Circuits ", Prentice Hall of India, 1998.
3. David A. Bell, " Solid State Pulse Circuits ", Prentice Hall of India, 1992.

References:

1.Millman J. and Taub H., " Pulse Digital and Switching waveform ", Tata McGraw Hill International

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3T03	Digital Electronics & Logic Design	4	3	1	-

Unit I: Introduction To Digital System

Number systems, binary arithmetic and codes: positional number system; binary, octal and hexadecimal number systems; representation of signed numbers; binary arithmetic –addition, subtraction, multiplications and division; fixed and floating point numbers ; binary coded decimal codes; Gray codes; error detection and correction codes-parity check codes and Hamming code.

Unit II: Boolean Algebra And Switching Functions

Boolean algebra; basic postulates and fundamental theorems of Boolean algebra; truth tables; basic logic operations and gate symbols ; algebraic forms of switching functions- SOP and POS forms, minterms and maxterms; derivation of canonical forms; minterms and maxterms; simplification of switching functions- K-map and quine-McCluskey tabular minimization methods; synthesis of combinational logic circuits-NAND and NOR networks.

Unit III: Logic Families

Introduction to different logic families; operational characteristics of BJT in saturation and cut-off regions; operational characteristics of MOSFET as switch; TTL inverter- circuit description and operation; CMOS inverter-circuit description and operation; other TTL and CMOS gates; electrical behavior of logic circuits- noise margins, fanout, transmission time, propagation delay, power dissipation.

Unit IV: Combinational Logic Modules

Decoders, encoders, multiplexers, de-multiplexers and their applications; three state devices and buses; code converter; binary adders: half adder and full adder, ripple carry adder, carry-look-ahead adder; subtractors ; multipliers; ALU; comparators; parity circuits; circuit timing-timing diagrams and specifications ; combinational circuit design examples.

Unit V: Sequential Logic Devices And Circuits

Latches; flip- flops; registers, shift-registers; counters ripple counters , synchronous counters , up-down counters, BCD counters, ring counters, timing diagrams and specifications; state machine models-synchronous state machines; state machine design examples design examples; design using ASM charts ; timing hazards and races ; design and analysis of asynchronous sequential circuits: pulse mode and fundamental mode.

Unit VI: Programmable Logic Devices (PLDs)

PROMs, PLAs, PAL, Semiconductor memory: organization, Operation, and classification.

Textbooks:

1. M. Mano, Digital Design, 2nd Ed. PHI, 1997.

2. J.F. Wakerly, Digital Design-principles and practices, 3rd Ed, Pearson Education; 2001.

References:

1. M.D. Ercegovac, T. Lang and J.H. Moreno, Introduction to Digital Systems, John Wiley, 2000.

2. V.P.Nelson, H.T.Nagle, B.D. Carroll and J.D. Irwin, Digital Logic Circuit Analysis and Design, Prentice-Hall,1995.

3 D.D. Gajski; Principles of Digital Design, Prentice Hall, 1996.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3T04	Signals and Systems	4	3	1	-

Unit I: Introduction to Signals and Systems

Signals and systems, signal types: energy and power signals, continuous and discrete time signals, analog and digital signals, deterministic and random signals; signal properties: symmetry, periodicity, elementary signals: unit step, unit impulse, the sinusoid, the complex exponential, Linearity, shift-invariance, causality, stability.

Unit II: Time domain representations for Linear Time-Invariant system

The impulse response and step response; convolution, Impulse response representation for LTI system, properties of the Impulse response representation for LTI system, interconnections; system representation through differential equations and difference equations, block diagram representations; eigen functions, frequency response and its relation to the impulse response.

Unit III: Fourier representation of signals

Fourier series representation, Fourier Transform and properties, Parseval's Theorem, response of system characterized by differential equation

Unit IV: Discrete-Time Fourier Transform (DTFT)

DTFT and properties, Parseval's Theorem; Discrete Fourier Transform (DFT) and properties. Laplace Transform for continuous time signals and systems: region of convergence, properties; s-domain analysis of LSI systems, poles and zeros of system functions and signals, stability, Minimum phase systems.

Unit V: Z-Transform and Sampling theorem

The Z-transform, region of convergence, properties of Z transform, z-domain analysis of linear discrete-time systems, Inverse Z Transform; Sampling theorem, reconstruction of continuous time signals, Discrete time processing of Continuous time signals, sampling of discrete time signals, effects of under sampling, aliasing and its effects.

Textbooks:

1. Allan V. Oppenheim et al, "SIGNALS AND SYSTEMS ", Prentice Hall of India Pvt. Ltd., 1997.

References:

1. Douglas K. Lindner, " Signals and Systems ", McGraw Hill International, 1999.
2. Simon Haykin and Barry Van Veen, " Signals and Systems ", John Wiley & Sons Inc., 1999.
3. Robert A. Gabel and Richard A. Roberts, " SIGNALS AND LINEAR SYSTEMS ", John Wiley, 3rd Edition, 1987.
4. Roger E. Zeimer et al, " SIGNALS AND SYSTEMS : Continuous and Discrete ", McMillan, 2nd Edition, 1990

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
IT3T3	Data Structures and Algorithm	3	3	-	-

Unit I

Basic concept of data structures, mathematical preliminaries-big oh notation, notion of space and time complexity, simple algorithms and illustration of their complexity, recursion.

Unit II

Elementary data structures: arrays and its representation. Stacks: prefix, infix and postfix conversion. Queues, link list.

Unit III

Trees: Basic terminology, Binary trees, Binary tree representation, traversal, threaded binary tree, Counting Binary Tree, Huffman coding using binary trees.

Unit IV

Graphs: Representation, traversal, connected components, shortest path and transitive closure, topological sort, BFS and DFS. Dijkstra's Algorithm, Floyd Warshall's Algorithm, Minimum Spanning Tree Definitions.

Unit V

Sorting- Bubblesort, selection sort, insertion sort, Shell sort; Quicksort; Heapsort;Mergesort; Radix sort; Analysis of the sorting methods. Selecting the top k elements. Lowerbound on sorting

Text books:

1. E. Horowitz and S. Sahani, " Fundamentals of Data Structures", GalgotiaBooksource Pvt. Ltd. 1999.
2. R.L.Kruse, B.P. Leung, C.L. Tondo, " Data Structure and program design in C",PHI,2000.

Reference books:

1. Schaum's outline series, " Data Structure", TMH, 2002.
2. Y.Langsamet. Al., " Data Structures using C and C++", PHI,1999.
3. Yashwantkanethkar, " Data Structure through C", BPB, 2005.
4. AV Aho, J hopcroft, JD Ullman, "Data Structures and Algorithms", Addison-Wesley.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
MAT3T1	Mathematics -III	4	3	1	-

Unit I

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series, complex form of Fourier series

Unit II

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

Unit III

Partial differential Equations

Formation, solutions of first order equation, singular solutions, Lagrange's Linear equation, Integral surfaces passing through a given curve, solutions of linear equations of second order ant their classifications-parabolic, elliptic and hyperbolic

Unit IV

Applications of Partial Differential Equations

Method of separation of Variables, Solutions of one dimensional wave equation and one dimensional heat equation, Steady state solution of two-dimensional heat equation

UNIT V

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform

Textbooks:

1) Higher Engineering Mathematics: B. S. Grewal
2) Advanced Engineering Mathematics: E. Kreyszig

Reference books:

1) Advanced Engineering Mathematics: Jain and Iyenger
2) Advanced Engg. Mathematics: Michael D. Greenberg
3) Advanced Engineering Mathematics (7th Edition): Bali N., Goyal M.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3L01	Electronic Devices & Circuits Lab	1	-	-	2

List of Experiments:

1. To Test Half Wave Rectifier with and without Capacitor Filter and determine the ripple factor and ,voltage regulation and efficiency
2. To Test Center tapped Wave Rectifier with and without Capacitor Filter and determine
3. The ripple factor and ,voltage regulation and efficiency
4. To Test Full Wave Bridge Rectifier with and without Capacitor Filter and determine
5. The ripple factor and ,voltage regulation and efficiency
6. Testing of positive and negative Shunt Clippers
7. Testing of Shunt Clippers with biasing
8. Testing of positive and negative Clampers
9. Testing of Voltage Regulation Using Zener Diode
10. To test series clipping single ended circuit for peak clipping and peak detection
11. To test double ended clipper for peak clipping and peak detection
12. To determine the input and output characteristics of CB npn transistor
13. To Determine the input and output characteristics of a CE npn transistor
14. To Determine the input and output characteristics of a CC npn transistor

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC3L02	Digital Electronics & Logic Design Lab	1	-	-	2

List of Experiments:

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip
   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and
   (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Wiring and testing Ring counter/Johnson counter.
12. Wiring and testing of Sequence generator.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC3L03	Data Structures Lab	1	-	-	2

List of Experiments

1. Program of linked list using array.
2. Program of single linked list using self reference structure.
3. Program of double linked list using self reference structure.
4. Program of circular linked list using self reference structure.
5. Program of stack using array.
6. Program of stack using linked list.
7. Program of queue using array.
8. Program of queue using linked list.
9. Program of queue using circular linked list.
10. Program of priority queue using linked list.
11. Program for conversion of infix to prefix and postfix notation and evaluation of prefix and postfix notation.
12. Program Insertion, Deletion and Traversal in Binary Search Tree.
13. Program Insertion, Deletion AVL Tree.
14. Program Insertion, Deletion Heap.
15. Program Insertion, Deletion B- Tree.
16. Program for creation of adjacency matrix.
17. Program to find path matrix by Warshall's algorithm.
18. Program for traversing a graph through BFS and DFS.
19. Program of shortest path between two nodes in graph using Djikstra algorithm.
20. Program for creating minimum spanning tree using Prim's and Kruskal's algorithm.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC4T01	Control Engineering	4	3	1	-

Unit I: Input/output Relationship

Introduction to Open Loop and Closed Loop Control systems. Mathematical Representation of Physical Systems. Transfer Functions Block Diagram and Signal Flow Graph. Reduction Algebra, Masons Gain.

Unit II: Time-Domain Analysis

Test Input Signals for Transient Analysis. Time Domain. Performance Criterion, Transient Response of First Order, Second Order & Higher Order Systems. Time Domain, Analysis: Static and Dynamic Error Coefficients. Error Criterion, Introduction to System Optimization.

Unit III: Frequency-Domain Analysis

Polar and Inverse Polar Plots, Bode-plot, Frequency Domain Specifications. Relative Stability Gain Margin and Phase Margin, Correlation with Time-domain, M & N Circles.

Unit IV: Stability Theory

Concept of Stability, Asymptotic & Conditional Stability, Routh Hurwitz Criterion, Nyquist Stability Criterion, Liapunov's Direct Method, Root Locus Plots.

Unit V: Compensation Techniques

Concept, Lag, Lead & Lag-Lead Networks, Design of Closed Loop Systems Using Compensation Techniques.

Unit VI: State Space Analysis of Control System: Analysis of Systems, Time Invariant State Equations, Transfer Matrices, Linear Time Varying Systems.

Textbooks:

1. I.J. Nagrath & M Gopal, “Control systems Engineering”, New Age International.

References:

1. Kuo B.C.” Automatic control System” PHI.
2. Ogata K “Modern control Engineering “PHI.
3. S. N.” Sivanandam Control System Engineering” Vikas Publishing House Pvt. Ltd .

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC4T02	Electromagnetic Field Theory	4	3	1	-

Unit I: Electrostatics

Vector Analysis, Fundamental of Electrostatics, Coulomb's law, electric field intensity, Gauss's law with application, electric flux density, boundary conditions, capacitance & capacitors, electrostatic energy, Laplace's & Poisson's equations, Divergence theorem, Energy stored in an electrostatic field.

Unit II: Magnetostatics

Magnetic field of a current carrying element, Ampere's Force law, The Biot-Savart law, Magnetic Flux and magnetic flux density, Gauss law for magnetic fields, Torque on a loop, Magnetic moment, Ampere's law and Magnetic field intensity, Magneto motive force, Energy stored in a magnetic field, Scalar and Vector magnetic potential, Field computation and problems.

Unit III: Time varying Fields & Maxwell's Equation

Faraday's law of electromagnetic induction, Self and Mutual Inductance, Maxwell's equations, electromagnetic boundary conditions, wave equations and their solutions, time harmonic fields.

Unit IV: Electromagnetic Waves

Electric and magnetic wave equations, uniform plane wave, Plane wave in loss less media, plane waves in lossy media, wave polarization, plane wave reflection from a media interface Poynting Vector and Power Flow Poynting theorem and application, instantaneous average and complex Poynting Vector.

Textbooks:

1. K.A. Gangadhar, 'Field Theory', Khanna Publishers
2. John D. Kraus, "Electromagnetics ". McGraw Hill, 1992

References:

1. W.H. Hayt, "Engineering Electromagnetics", McGraw Hill, 1995.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC4T03	Microprocessor	4	3	1	-

Unit I:Introduction to Microprocessors

Evolution microprocessor, register structure, ALU, BUS Organization, timing and Control.

Unit II: Architecture of a 8-blt Microprocessors

Organization of 8085 Bus Interface sequential Memory Organization, Bus Unit, Execution Unit, Register Organization, Cycle.

Unit III: Assembly Language Programming

Addressing Modes, Data Transfer Instructions, Arithmetic and Logic Instructions, Program control Instructions (Jumps, Conditional Jumps, Subroutine Call) loop and string instructions, Assembler Directives, Parameter Passing and Recursive Procedures.

Unit IV: CPU Module Design

Signal Description of 8085, Clock Generation, Address and Data bus Demultiplexing, Buffering, memory Organization, Read and Write Cycle Timings, Interrupt Structures.

Unit V: Basic I/O Interfacing

Programmed I/O, Interrupt liven I/O, .DMA, Parallel I/O -8255, Serial I/O (8 5118250, RS-232 Standard), 8259-Programmable Interrupt Controller, 8237-DMA controller, 8253/8254-Programmable Timer/Counter, AID and D/ A Conversion.

Unit VI: Memory Interfacing

Types of Memory, RAM and ROM Interfacing with Timing Considerations, DRAM

Interlacing, Trouble Shooting of Memory Module. Advanced Microprocessors and Microcontrollers.

Text books :

1. Microprocessor Architecture and interfacing: Ramesh S.Gaonkar
2. Microprocessor: A.P.Mathur.

References:

1. Microprocessors & Interfacing – Douglas U. Hall, 2007.
2. Microprocessors and Microcontrollers Kumar, Senthil, Saravanan, Jeevananthan Oxford University, New Delhi, latest edition.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC4T04	Linear Integrated Circuits	3	3	-	-

Unit I: Introduction

OP-AMP Fundamentals (brief review of. differential amplifier, Current mirror; active load, level shifter, output stage; ac and dc characteristics) Basic building blocks using OP-AMPS.

Unit II: lC OP-AMP Applications

Inverting/Non-inverting VCVS, Integrators, Differentiators CCVS, Instrumentation Amplifiers, Biquad Filter (LP, HP, BP and Notch), Oscillators

Unit III: More OP Amp Applications

Logarithmic Amplifiers, Log/ Antilog Modules, Precision rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator,. lC Analog Multiplier applications, Analog Multiplexer and Demultiplexer.

Unit IV: Other Linear IC applications

555 timer - Basic timer circuit, 555 timer used as astable and monostable multivibrator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator; D/A and A/ D converters –Basic DAC Techniques, AD converters

Unit V: Voltage Regulators

OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78179, XX), 723 IC Regulators (Current Limiting, Current Fold Back); • MPS.

Unit VI: PLL

PLL-operating principles, Phase detector / comparator, VCO and applications

Textbooks:

1. Gayakwad,' OP Amps and Linear Integrated Circuit ',PHI.
2. "Linear Integrated Circuits", D. Roy Choudhury and Shail B. Jain, 2nd edition, Reprint 2006, New Age International

References:

1. "Operational Amplifiers and Linear Integrated Circuits", Robert. F. Coughlin & Fred.F. Driscoll, PHI/Pearson, 2006.
2. **"**Operational Amplifiers and Linear IC's**",** David A. Bell**,** 2nd edition, PHI/Pearson, 2004

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC4T05	Electronic Measurements & Instrumentation	3	3	-	-

Unit I: Theory of Measurement

Introduction, Performance Characterise tics: static & dynamic standards, Error analysis: Sources, Types and statistical Analysis. Analog meters: DC and AC voltmeter and ammeters (PMMC, Moving Iron), Electronic analog ohmmeter and multimeter

Unit II: Transducers

Passive transducers: Resistive, Inductive and capacitive, Active transducers: Thermoelectric, piezoelectric & photoelectric, Bridges: Direct current and alternating current bridges, LCR bridges

Unit III: Converters

Analog to digital converter: Transfer characteristics, A/D Conversion techniques: Simple potentiometric & servo method, successive approximation, ramp type, Integrating & dual-slope integrating method. *DI* A Converter performance characteristics of D/A converters.

Unit IV :Display devices

Decimal, BCD and straight binary number, indicating system, numeric & alpha number display using LCD & LED, specification of digital meters: display digit & counts Resolution, sensitivity, accuracy, speed & settling time etc.

Unit V : Oscilloscopes & RF Measurements

Types of oscilloscopes, controls, Measurements voltage, frequency time & Phase. High frequency measurements - RF impendence

Unit VI: Probes

Types of probes, probe loading & measurement effect, probe specifications. Signal generators & analyzers

Text books :

1. A course in Electrical and Electronic Measurements and Instrumentation by A.K Sawney, Danpat Rai & Sons Educational & Technical Publishers

2.Electronic Instruments & Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005

References:

1."Electronics Instrumentation" by H.S. Kalsi TMH Ed. 2004

2. "Modern Digital Electronics" by RP Jain. Macgraw Hill Publishing Company Ltd

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
MAT4T1	Mathematics -IV	4	3	1	-

Unit I

Probability: Sample space, conditional probability, independent variables and independent experiments, Baye's theorem, Random variables(continuous and discrete), probability density function, cumulative distribution function, moment generating function

Unit II

Probability distributions-Binomial, Poisson, Normal

Unit III

Sampling, Sampling distribution, standard error, Student's t-distribution, Chi-square test as a test of goodness of fit.

Unit IV

Numerical solution of algebraic and transcendental equations by bisection method, Regula-Falsi method, Newton-Raphson's method, Solution of linear simultaneous equations- Gauss elimination and Gauss-Seidel iterative method

Unit V

Finite differences-Forward, backward and central differences, Newton's forward and backward interpolation formulae, Lagrange interpolation, Newton's divided difference formula, Numerical differentiation at the tabulated points with forward backward and central differences. Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

Textbooks:

1) Higher Engineering Mathematics: B. S. Grewal
2) Advanced Engineering Mathematics: E. Kreyszig

Reference books:

1) Advanced Engineering Mathematics: Jain and Iyenger
2) Advanced Engg. Mathematics: Michael D. Greenberg

3) Advanced Engineering Mathematics (7th Edition): Bali N., Goyal M

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC4L01	Microprocessor Lab	1	-	-	2

List of Experiments

1) Data transfer instructions like:
   i] Byte and word data transfer in different addressing modes.
   ii] Block move (with and without overlap)
   iii] Block interchange
2) Arithmetic & logical operations like:
   i] Addition and Subtraction of multi precision nos.
   ii] ASCII adjustment instructions
   iii] Code conversions
   iv] Logical operations
3) Bit manipulation instructions like checking:
   i] Whether given data is positive or negative
   ii] Whether given data is odd or even
   iii] Logical 1's and 0's in a given data
   iv] 2 out 5 code
   v] Bit wise and nibble wise palindrome
4) Branch/Loop instructions like:
   Arrays: addition/subtraction of N nos.
   Finding largest and smallest nos.
   Ascending and descending order
5) Programs on String manipulation like string transfer, string reversing, searching for a string, etc.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC4L02	Linear Integrated Circuits Lab	1	-	-	2

List of Experiments:

1. Study of OP AMP as an Integrator
2. Study of OP AMP as a Differentiator
3. To Design and test the performance of ZCD and Schmitt Trigger using OP AMP
4. To design a precision Half Wave Rectifier using IC 741
5. Design and Testing of IC 723 Voltage Regulator
6. Design and implementation astable and monostable multivibrator using IC 555 Timer for a given frequency
7. To Design a precision Full Wave Rectifier using IC 741
8. To Study the application of IC 741-Inverting Amplifier, Non Inverting Amplifier, Voltage Follower
9. To study active low pass, high pass and band pass filter
10. To study RC phase shift and Wein Bridge Oscillators using IC 741
11. Design and test of R-2R DAC using OP Amp

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC5T01	Antenna & Wave Propagation	4	3	1	-

Unit I: Electromagnetic Field Radiation: Radiation from an oscillating current element, short monopole and dipole, Half wave dipole, Radiation Pattern, Power radiated, Radiation Resistance.

Unit II: Antenna Terminology: Antenna Theorems, Superposition, Reciprocity. Isotropic radiator, Directive Gain, Power Gain, Efficiency , Effective Area, Effective Length, Bandwidth, Beam Width & Polarization, Directional patterns, Directivities, Effective length, Antenna Impedance.

Unit III: Antenna Arrays: Uniform linear arrays - Broadside, End Fire, Collinear, Parasitic arrays, Binomial arrays, pattern multiplication.

Unit IV: Practical Antennas: VLF, LF, & Transmitting antennas- Vertical radiator, Effect of ground, Grounded Antennas, Grounding systems, Effect of Antenna Height, Antenna Top Loading and Tuning, Antenna Arrays .in MF Band, Antenna coupling at medium frequency, Travelling wave antenna, long wire. harmonic antennas, Rhombic antenna. VHF & UHF Antennas - Folded dipoles, yagi Uda, Come reflector, Helical, Frequency independent Log periodic antenna. Microwave antennas-Parabolic reflector, feed systems. Lens antennas.

Unit V: Radio wave Propagation: Modes 0 Radio wave Propagation - Ground 'Nave &Surface Wave Propagation Effect of Earth 85 Terrain, Ionosphere propagation, Structure of ionosphere, Sky Wave Propagation, Critical Frequency, Effect of Earth's Magnetic Field Virtual Height, Maximum Usable Frequency, Skip Distance, Noise, Precipitation, Static, Fading, Multi-Hop Propagation, Space wave propagation Range, Effect of Earth's Curvature Tropospheric Propagation, Duct Propagation.

Textbooks:

1.Jordan Edwards C. and Balmain Keith G./Electromagnetic Waves and Radiating Systems PHI

2.H. H.T Jr.William H.I Engineering Electromagnetics/TMH Krauss D. Antennas/TMH Krauss J.D.I Antennas,TMH

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC5T02	Digital System Design	3	3	-	-

Unit I: Introduction to VHDL

Traditional design method, traditional schematic symbols, symbols Vs entities, Architectures, component installation, Behavioral descriptions, event scheduling, and statement concurrency.

Unit II: Behavioral Modeling

Introduction to behavioral modeling, transport Vs inertial delay, transport models, drivers, generics, block statement.

Unit III: Sequential Processing

Process statement; signal assignment Vs variable assignment, sequential statements. Data types and expressions; Object types, data types, type classification, File type.

Unit IV: Sub- Programs and Packages

Sub-programs, function, conversion functions, Resolution functions, procedures, package declaration, deferred constant, sub-program declaration, default configurations, component configurations, mapping library entities, generics in configurations, generic value specification in architecture, generic specification IP configuration, block configurations.

Unit V: VHDL synthesis

RTL level description, constraints, attributes, technology libraries, simple gate. IF control flow statement, some circuit examples like sequential circuits, 4-bit shifter, state machine examples.

Text books:

1. VHDL - Douglas Perry - Mc H _3rd Edn.
2. The designers guide to VHDL - Peter J. Ashenden, Horgan Kaufman Pub.

References:

1.VHDL technique: - Joseph Pi k. McGH

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC5T03	Analog Communication	4	3	1	-

Unit I: Introduction

Elements of Communication System and its Fundamental Limitation, Modulation: types, Benefits and Applications.

Unit II: Amplitude Modulation

Introduction, AM: Time domain description and Frequency domain description, Generation and Detection of AM, DSBSC: Time domain description and Frequency domain description, Generation and Detection of DSBSC, Hilbert Transform, SSB: Time domain description and Frequency domain description, Generation and Detection of SSB, VSB: Time domain description and Frequency domain description, Generation and Detection of VSB, Comparison of amplitude modulation techniques.

Unit III: Angle Modulation

Basic definitions, FM, narrowband FM, Wideband FM, transmission bandwidth of FM waves, generation of FM waves: indirect and direct FM, demodulation of FM.

Unit IV: Noise

Introduction, shot noise, thermal noise, white noise, equivalent noise bandwidth, noise figure, noise temperature, Calculation of Noise Figure for cascaded networks, Experimental determination of Noise Figure.

Unit V: Noise in continuous wave modulation systems

Introduction, receiver model, Noise in DSB-SC, SSB-SC, AM System, Noise in FM, FM Threshold effect, Pre Emphasis and De-emphasis in FM.

Text books :

1. Sanjay Sharma / Communication systems/ S.K. Kataria & Sons
2. Taub & Schilling /Communication Systems / TMH. (II edition)

References:

1. S. Haykin Communication system j john Willy Sons/IN Edn.),
2. AB. Carlson /Communication systems / TMH.
3. B.P. Lathi Modern Analog & Digital Communication Systems Oxford Univ. Press.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC5T04	Microcontroller	3	3	-	-

Unit I

Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software. The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

Unit II

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing, Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

Unit III

8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

Unit IV

8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

Unit V

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C.

Unit VI

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C. 8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

Unit VII

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA. Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt. Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock

TEXT BOOKS:

1. The 8051 Microcontroller and Embedded Systems – using assembly and C -, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. MSP430 Microcontroller Basics, John Davies, Elsevier, 2008.

REFERENCE BOOKS:

1. The 8051 Microcontroller Architecture, Programming & Applications, 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. The 8051 Microcontroller, V.Udayashankar and MalikarjunaSwamy, TMH, 2009
3.MSP430 Teaching CD-ROM, Texas Instruments, 2008 (can be requested http://www.uniti.in) 4. Microcontrollers: Architecture, Programming, Interfacing and System Design, Raj Kamal, "Pearson Education, 2005

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC5T05	Information Theory & Coding	4	3	1	-

UNIT - 1

INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Markoff statistical model for information source, Entropy and information rate of mark-off source.

UNIT - 2

SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels,
Continuous channels.

UNIT - 3

FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual
Information, Channel Capacity.

UNIT - 4

Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

UNIT - 5

INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and

correction, Standard arrays and table look up for decoding.

UNIT - 6

Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes.

UNIT - 7

RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

UNIT - 8

Convolution Codes, Time domain approach. Transform domain approach

Textbooks:

1. K. Sam Shanmugam, John Wiley 'Digital and Analog Communication Systems', India Pvt. Ltd., 2008.
2. Taub & Schilling.'Principles of Communication system' .
3. John G.Proakis 'digital Communications' Tata Mc Graw Hill
4. Digital Communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

References:

1. Communication Systems, Sanjay Sharma, Fifth Revised Ed June 2011
2. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007.
3. Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC5T06	Management and Entrepreneurship	3	3	-	-

Unit I: Management

Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of Management - Management as a Science, Art or Profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought-Early Management Approaches-Modern Management Approaches.

Unit II: Planning

Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making – Importance of planning - steps in planning & planning premises - Hierarchy of plans.

Unit III: Organising And Staffing

Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – Centralisation Vs Decentralisation of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief).

Unit IV: Directing & Controlling

Meaning and nature of directing - Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

Unit V: Entrepreneur

Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur – an emerging Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

Unit VI: Small Scale Industry

Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI;

Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I., Effect of WTO/GATT Supporting Agencies of Government for S.S.I Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only).

Unit VI: Institutional Support

Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC

Unit VII: Preparation Of Project

Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities - Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

Textbooks:

1. Principles of Management - P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th Edition, 2010.
2. Dynamics of Entrepreneurial Development & Management – Vasant Desai Himalaya Publishing House.
3. Entrepreneurship Development - Small Business Enterprises - Poornima M Charantimath - Pearson Education – 2006.

References:

1. Management Fundamentals - Concepts, Application, Skill Development Robert Lussier – Thomson.
2. Entrepreneurship Development - S S Khanka - S Chand & Co.
3. Management - Stephen Robbins - Pearson Education /PHI -17th Edition, 2003.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC5L01	Microcontroller Lab	1	-	-	2

List of Experiments

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX.
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

8. Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.
9. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
10. Alphanumeric LCD panel and Hex keypad input interface to 8051.
11. External ADC and Temperature control interface to 8051.
12. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.

13. Stepper and DC motor control interface to 8051.
14. Elevator interface to 8051.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC5L01	Digital System Design Lab	1	-	-	2

List of Experiments
1. Write VHDL code to realize all the logic gates
2. Write a VHDL program for the following combinational designs
a. 2 to 4 decoder
b. 8 to 3 (encoder without priority & with priority)
c. 8 to 1 multiplexer
d. 4 bit binary to gray converter
e. Multiplexer, de-multiplexer, comparator.
3. Write a VHDL code for 4 bit parallel Adder.
4. Write a VHDL code to describe the functions of a Full Adder Using three modeling styles.
5**.** Write a model for 32 bit ALU using the schematic diagram shown below
A (31:0) B (31:0) Out
• ALU should use combinational logic to calculate an output based on the four bit op-code input.
• ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
6. Develop the VHDL code for the following flip-flops, SR, D, JK, T.
7. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC6T01	Digital Communication	4	3	1	-

Unit I: Introduction
Digital communication, Model of a digital communication system, Advantages and disadvantages of digital communication, performance comparison of analog and digital modulation.
Unit II: Sampling Theory and pulse Modulation
Sampling theorem, Nyquist rate, Signal reconstruction in time domain, Aliasing, Sampling techniques, analog pulse modulation techniques, Method of generation and detection of PAM, PWM and PPM.
Unit III: Waveform Coding Techniques
Discretization in time and amplitude, PCM generation and receiver, Linear quantizer, Quantization noise, calculation of signal to quantization noise ratio, non-uniform quantizer, companding, A law & μ law companding, Delta modulation, Adaptive delta modulation, Differential pulse code modulation, Comparison of PCM and AM.
Unit IV: Digital Multiplexing
Multiplexing, Fundamentals of time division multiplexing, digital multiplexers, Multiplexing hierarchy for digital communication, North-American hierarchy, T lines, TI carrier system, E lines.
Unit V: Digital Base band transmission
Line Coding & its properties, NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra (No derivation), HDB and B8ZS signaling, Matched filter - derivation of impulse response and probability of error, ISI, Nyquist criterion for distortionless baseband binary transmission,
Unit VI: Digital Modulation techniques

Types of digital modulation, wave forms for Amplitude, frequency and phase shift keying. Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, QPSK and MSK, Probability of error and comparison of various digital modulation techniques.

Text books :

1. Sanjay Sharma, "Communication systems" S.K. Kataria & Sons
2. Taub & Schilling "Communication Systems "TMH. (II edition)

References:

1. S. Haykin "Communication system" john Wiley Sons III Edn.),
2. AB. Carlson "Communication systems "TMH.
3. B.P. Lathi Modern Analog & Digital Communication Systems Oxford Univ. Press .

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6T02	Microwave Engineering	3	3	-	-

Unit I: Microwave Transmission lines

Transmission line equations and Solutions, Reflection and Transmission Co-efficient, Standing waves and SWR, Line impedance and Admittance,
Impedance matching using Smith chart.

Unit II: Microwave wave guides

Detailed study of Rectangular and Circular waveguides. Microwave components: Cavity resonators, Slow wave structures, Microwave hybrid circuits, S-parameters, Wave guide Tees, Directional Couplers, Circulators and Isolators, Hybrid couplers

Unit III: Microwave components

Waveguide couplings, bends and twists, Transition, Matched load, Attenuators and phase shifters, Wave-guide discontinuities, Windows, Irises and Tuning screws, Detectors, wave meters

Unit V: Microwave Tubes

Limitations of conventional Active Devices at- Microwave Frequency, Klystron Reflex Klystron, Magnetron, TWT, BWO Schematic, Principle of operation, performance characteristics and applications.

Unit VI: Microwave Solid State Devices

Transistors, Tunnel Diodes, FETs, PIN ,Gunn diodes, InP, CdTe diodes, Avalanche transit time devices-Read Diode, IMPATT, TRAPATT, BARITT Diodes, their Principle of operation, characteristics and applications.

Textbooks :

1. Liao, S.Y. Microwave Devices & Circuits/ PHI 3rd Ed.
2. A. Das, S.K. Das, Microwave Engineering, TMH 2nd Ed.

References:

1. Collin, R.E. Foundations for microwave Engg. /TMB 2nd' Ed.
2. Rizzi Microwave Engineering: Passive Circuits/ PHI

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6T03	VLSI Technology	3	3	-	-

Unit I: Introduction

Historical perspective, general overview of design hierarchy, integration density and Moore's law, VLSI design styles.

Unit II: Fabrication of MOSFETs

Fabrication Process flow, basic steps, fabrication of nMOS transistor, CMOS n-Well process, Layout design rules, CMOS inverter layout design, stick diagram

Unit III: MOS transistor

MOS structure, MOS system under external bias, structure & operation of MOSFET, MOSFET: current voltage characteristics, channel length modulation, substrate bias effect, scaling and small geometry effects, MOSFET capacitance, Junction capacitance.

Unit IV: MOS inverters

Resistive load inverter, Inverters with n- type MOSFET load, noise immunity & noise margin, CMOS inverter, Delay time definitions, calculation of delay time, estimation of interconnect parasitic, calculation of interconnect delay, switching power dissipation of CMOS inverters, Bi-Cmos circuit: static behavior and switching delay.

Unit V: Combinational MOS logic circuits

MOS Logic circuits with Depletion nMOS loads: two input NOR & NAND gate, CMOS Logic circuits: Two input NOR & NAND gate, CMOS transmission gate, implementation of Boolean function using CMOS

Unit VI: Sequential MOS Logic Circuits

SR latch circuit, clocked Latch & flip flop circuit, CMOS D latch and edge triggered flip-flop Dynamic pass transistor circuit, voltage bootstrapping, CMOS transmission gate logic, high performance dynamic CMOS circuits.

Unit VII: Semiconductor memories

ROM circuits layout, design of row & column decoders, Static and dynamic read-write memory circuits.

Textbooks:

1. Principles of CMOS VLSI Design: A System Perspective By Neil Weste and K. Eshragian 2nd Edition 2000 (Pearson Education (Asia) Pte. Ltd.).

2. Modern VLSI design: System on Silicon By Wayne, Wolf 3 Edition 2005 (Pearson Education).

References:

1. Basic VLSI Design By Douglas A Pucknell & Kamran Eshraghian 3 Edition 2005 (PHI).

2. CM OS Digital Integrated Circuits: Analysis and Design By Sung - Mo Kang & Yosuf Leblebici 3 Edition 2003 (TMH)

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6T04	Power Electronics	3	3	-	-

Unit I :Power Semiconductor Devices

Power diodes - Rower transistors - MOSFET and IGBT - Construction and characteristics of SCR Turn-on and Turn-off methods - Two-transistor model- Switching performance - Triggering circuits - TRIAC - Snubbed circuits - Special semiconductor devices.

Unit II: Phase-Controlled Converters

2-pulse - 3-pulse and 6-pulse converters - Performance measures - Inverter operation of fully controlled converter - Effect of source impedance=- Effect of load inductance

Unit III: Dc To Dc Converters

Step-down and step-up choppers - Time ratio control and current limit control- Switching mode regulators - Buck - Boost - Buck-Boost and cook converter - Resonant switching based SMPS,UPS

Unit IV: Inverters

Forced commutation techniques - Single-phase and three-phase (both 120° mode and 1800 mode) inverters - PWM techniques - Voltage and harmonic control- Series resonant inverter - Voltage and current source inverters.

Unit V: AC Voltage Controllers

Principle of on-off control and phase control- Single-phase bidirectional controllers with Rand RL loads - Three-phase full-wave controllers - Three-phase bidirectional delta-

connected controllers - PWM control- Cycloconverters: Single-phase and Three-phase.

Textbooks :

1. Muhammad H. Rashid, If Power Electronics: Circuits, Devices and Applications", 3rd Edition, Pearson Education/Prentice Hall, 2004.
2. Singh and Khanchandani, K.B., "Power Electronics", 2nd Edition, Tata McGraw Hill, 2004.

References :

1. Bhimbra, P. 5., "Power Electronics", 4th Edition, Dhanpat Rai and Sons, 2000.
2. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2003:
3. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics Converters Applications and Design", 3rd Edition, John Wiley and Sons, 2003

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC6T05	Microelectronic Circuits	3	3	-	-

Unit I :MOSFETS

Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation modes, single stage MOS amplifiers. MOSFET internal capacitances and high frequency modes, Frequency response of CS amplifiers, CMOS digital logic inverter, detection type MOSFET.

Unit II :Single Stage IC Amplifier

IC Design philosophy, Comparison of MOSFET and BJT, Current sources, Current mirrors and Current steering circuits, high frequency response.

Unit III: Single Stage IC amplifiers (continued)

CS and CF amplifiers with loads, high frequency response of CS and CF amplifiers, CG and CB amplifiers with active loads, high frequency response of CG and CB amplifiers, Cascade amplifiers. CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance. SPICE examples.

Unit IV : Differences and Multistage Amplifiers

The MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, Differential amplifier with active loads, frequency response and differential amplifiers. Multistage amplifier. SPICE examples.

Unit V: Feedback.

General Feedback structure. Properties of negative feedback. Four basic feedback topologies. Series-Shunt feedback. Determining the loop gain. Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples.

Unit VI: Operational Amplifiers

The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters.

Unit VII: Digital CMOS circuits.

Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples.

Textbooks:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5th Edition, Oxford University Press, Interantional Version, 2009.

References :

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.

2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6T06	Digital Switching Systems	3	3	-	-

Unit I : Introduction

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

Unit II: Evolution Of Switching Systems And Digital Switching Systems

Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems. Fundamentals : Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing.

Unit III: Telecommunications Traffic

Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems

Unit IV : Switching Systems

Introduction, Single stage networks, Grading, Link Systems, GOS of Linked systems.

Unit V : Time Division Switching

Introduction, space and time switching, Time switching networks, Synchronization

Unit VI : Switching System Software

Introduction, Scope, Basic software architecture, Operating systems, Database Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Digital switching system software classification, Call models, Connect sequence, Software linkages during call, Call features, Feature flow diagram, Feature interaction.

Unit VII :Maintenance Of Digital Switching System

Introduction, Scope, Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability, Embedded patcher concept, Growth of digital switching system central office, Generic program upgrade, A methodology for proper maintenance of digital switching system, Effect of firmware deployment on digital switching system, Firmware-software coupling, Switching system maintainability metrics, Upgrade process success rate, Number of patches applied per year, Diagnostic resolution rate, Reported critical and major faults corrected, A strategy improving software quality, Program for software process improvement, Software processes improvement, Software processes, Metrics, Defect analysis, Defect analysis.

Unit VIII: A Generic Digital Switching System Model

Introduction, Scope, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital system, Common characteristics of digital switching systems. Analysis report. Reliability analysis.

Text books:

1. **Telecommunication and Switching, Traffic and Networks** - J E Flood**:** Pearson Education, 2002.
2. **Digital Switching Systems**, Syed R. Ali, TMH Ed 2002.

References:

1. **Digital Telephony** - John C Bellamy: Wiley India India Pvt. Ltd, 3rd Ed, 2008.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6L01	Communication Systems Engineering Lab	1	-	-	2

List of Experiments:

1. To obtain and measure frequency deviation and modulation index of FM
2. To plot the Demodulation Characteristics of the FM Demodulator
3. Sampling and Multiplexing Techniques and Reconstruction
4. Study of TDM Pulse Amplifier Modulation/Demodulation with its clock and Channel identification information linked directly to the reciever
5. Analog signal sampling and reconstruction
6. Study of Pre-emphasis Circuit and its response
7. Study of De-emphasis circuit and its response
8. Study of frequency Division Multiplexing
9. Study of Frequency Division Demultiplexing
10. Delta Modulation and Demodulation
11. Adaptive Modulation and Demodulation
12. Sigma Delta Modulation and Demodulation
13. Study of PAM ,PWM,PPM
14. DSB AM Generator

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC6L02	Power Electronic Lab	1	-	-	2

List of Experiments:

1. To Study Transfer characteristics of JFET
2. To obtain the characteristics of MOSFET
3. To determine the Static Characteristics of TRIAC
4. To obtain the VI Characteristics of SCR
5. To obtain the generation of Half Wave Rectifier using RC Circuit
6. To obtain the generation of Full Wave Rectifier using RC Circuit
7. To obtain variable AC fro DC ripple input
8. To study the characteristics of IGBT
9. AC voltage control by using TRIAC and DIAC
10. To study the performance and waveform of full wave controlled rectifier with resistive and inductive load

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7T01	Computer Communication Networks	3	3	-	-

Unit I: Introduction

Uses of Computer Networks, Network Architecture, Reference Model (ISO-OS1, TCPIIP-Overview, IP Address Classes, Subneting), Domain Name Registration & Registrars

Unit II : The Physical Layer

Theoretical basis for data communication, transmission media-Magnetic Media, Twisted Pair, Baseband Coaxial Cable, Broadband Coaxial Cable, Fiber Cable, Structured Cabling, Cable Mounting, Cable Testing, Wireless transmission, the telephone system, narrowband ISDN, broadband ISDN and ATM.

Unit III: The Data Link Layer

Data link layer design issues, error detection and correction, data link protocols, sliding window protocols, Examples of Data Link Protocols.

Unit IV :The Medium Access Sublayer

The channel allocation problem, multiple accesses protocols, IEEE standard 802 for LANS and MANS, high-speed LANs, satellite networks, Network devices- repeaters, hubs, switches and bridges.

Unit V :The Network Layer

Network layer design issues, routing algorithms, congestion control algorithm, inter networking, the network layer in the Internet, the network layer in ATM networks.

Textbooks :

1. A.S. Tananbaum, "Computer Networks", 3rd Ed, PHI, 1999.

References:

1.U. Black, "Computer Networks-Protocols, Standards and Interfaces",PHI,
2. W. Stallings, "Computer Communication Networks", PHI, 1999.
3. Laura Chappell, "Introduction to Cisco Router Configuration", Techrnedia, 1999.
4. Michael A. Miller, "Data & Network Communications", Vikas Publication, 1998.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7T02	Digital Signal Processing	4	3	1	-

Unit I: General Concepts of Digital processing

Typical Signal processing operation; examples of typical signals, signal processing application basic elements of DSP, overviews of DSP Systems, Advantages and disadvantages of DSP.

Unit II : Structures For Discrete Time System

Basic building block of a discrete time system, pick off node, adder, multiplier, unit delay, structures for FIT systems, direct form, cascaded form, frequency sampling and lattice transposed structures, cascade form, parallel form and lattice-ladder structure.

Unit III: Discrete Fourier Transforms

Definitions, properties-linearity, shift, symmetry etc, circular convolution – periodic convolution, use of tabular arrays, circular arrays, stock hams's method, linear convolution – two finite duration sequence, one finite & one infinite duration, overlap add and save methods**.**

Unit IV : Fast Fourier Transforms Algorithms

Introduction, decimation in time algorithm, first decomposition, number of computations, continuation of decomposition, number of multiplications, computational efficiency, decimation in frequency algorithms, algorithm, inverse decimation in time and inverse decimation in frequency algorithms, decomposition for a composite number N=9.

UNIT–V: **Design Of IIR Digital Filters**

Introduction, impulse invariant & bilinear transformations, all pole analog filters- Butterworth & chebyshev, design of digital Butterworth & chebyshev, frequency transformations

UNIT VI: Design of FIR Digital Filters

Introduction, windowing, rectangular, modified rectangular, Hamming, Hanning, Blackman window (excluding Kaiser window), frequency sampling techniques.

UNIT – VII: Realization Of Digital Systems: Introduction, block diagrams and SFGs, realization of IIR systems- direct form, cascaded, parallel form, ladder structures for equal degree polynomial, realization of FIR systems – direct form, cascade form, linear phase realization.

Textbooks:

1. John G Proakis, Dimitris G Manolakis,'Digital Signal Processing', Pearson Prentice Hall 4th Edition.

References:

1. S.Salivahanan, A.Vallaraj, C.Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill.
2. Discrete Time Signal Processing, Oppenheim & Schaffer, PHI, 2003.

3. Digital Signal Processing, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7T03	Wireless Communication	4	3	1	-

Unit I

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g, 3G and 4G networks.

Unit II

Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment.

Unit III

Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security.

Unit IV

GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers

Unit V

GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems.

Unit VI

CDMA technology, CDMA overview, CDMA channels concept CDMA operations.

Unit VII

Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware.

Unit VIII

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies.

Textbooks:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

References:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1st edition, 2010.
5. "**Wireless Communication – Principles & Practice**", T.S. Rappaport, PHI 2001.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7EL1	Embedded System and Design	3	3	-	-

Unit I :Introduction to Embedded System

Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process.

Unit II : The Hardware Side

An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A First Look, Embedded Systems-An Instruction Set View,

Embedded Systems-A Register View, Register View of a Microprocessor The Hardware Side: Storage Elements and Finite-State Machines (2 hour) The concepts of State and Time, The State Diagram, Finite State Machines- A Theoretical Model.

Unit III: Memories and the Memory Subsystem

Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

Unit IV : Embedded Systems Design and Development

System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project.

Unit V : Real-Time Kernels and Operating Systems

Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

Unit VI : Performance Analysis and Optimization

Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

Textbooks:

1. Embedded Systems – A contemporary Design Tool, James K. Peckol, John Weily India Pvt. Ltd, 2008.

References :

1. Embedded Systems: Architecture and Programming, Raj Kamal, TMH. 2008.
2. Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers, Tammy Noergaard, Elsevier Publication, 2005.
3. Programming for Embedded Systems, Dream tech Software Team, John Wiley India Pvt. Ltd, 2008

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7EL2	Operating Systems	3	3	-	-

Unit I : Introduction And Overview Of Operating Systems

Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems.

Unit II :Structure Of The Operating Systems

Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems.

Unit III: Process Management

Process concept, Programmer view of processes, OS view of processes, Interacting processes,

Threads, Processes in UNIX, Threads in Solaris**.**

Unit IV : Memory Management

Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation.

Unit V: Virtual Memory

Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.

Unit VI: File Systems

File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system.

Unit V : Scheduling

Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX.

Unit VI :Message Passing

Implementing message passing, Mailboxes, Inter process communication in UNIX.

Textbooks:

1.“Operating Systems - A Concept based Approach”, D. M. Dhamdhare, TMH, 3rd Ed, 2010

References:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.

2. **Operating System – Internals and Design Systems**, William Stalling, Pearson Education, 4th Ed, 2006.

3. **Design of Operating Systems,** Tanenbhaum, TMH, 2001

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7EL3	Optical Fiber Communication	3	3	-	-

Unit I: Introduction

Block diagram of optical communication system, Advantages of optical communication.

Unit II : Optical Fiber

Structure of optical wave-guide, Light propagation in optical fiber. Ray and Wave theory, Modes in optical fiber, Step' and graded index fibers. Transmission Characteristics of Optical Fibers: Signal degradation in optical fibers. Dispersion and pulse broadening in different types of fibers, Modal birefringence and polarization maintaining fibers.

Unit III : Optical sources

LASER: Stimulated a spontaneous emission, Principle of laser action, Population inversion, Lasing conditions, two and three level ASE, types of lasers, and fabrication of different types of Lasers. Power launching in optical fields. Applications of Lasers

LED: Physical process involved in the light emission in LED. Structural details and characteristic of basic LED. Edge emitting LED. Fabrication and characteristics of semiconductor lasers and LED's

Unit IV : Optical Detectors

Requirements for Photo detectors, Types of photo detectors, Characteristics of photo detectors. Principle of APD and PIN diodes. Noise in photo detectors, Phototransistors and Photo conductors.)

Unit V: Optical Fiber communication Systems

Components of optical fiber communication systems, Modulation formats, digital and analog.

optical communication Systems, (Analysis and performance of optical System design for optical communication.

Textbooks:

1.Optical.Fiber communication: G. Senior

References:

1. Optoelectronics: Ajay Ghatak
2. Optical Fiber communication: G.Keiser

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7EL4	Multimedia Communication	3	3	-	-

Unit I :Multimedia Communications

Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS.

Unit II : Multimedia Information Representation

Introduction, digital principles, text, images, audio, video.

Unit III : Text And Image Compression

Introduction, compression principles, text compression, image compression.

Unit IV : Audio And Video Compression

Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

Unit V : Multimedia Information Networks

Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

Unit VI : The Internet

Introduction, IP Datagram, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8.

Unit VII : Broadband ATM Networks

Introduction, Cell format, Switch and Protocol Architecture ATM LANs.

Unit VIII : Transport Protocol

Introduction, TCP/IP, TCP, UDP, RTP and RTCP.

Textbooks:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

References :

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7EL5	Body Area Network	3	3	-	-

Unit I: Introduction

Definition, BAN and Healthcare, Technical Challenges- Sensor design, biocompatibility, Energy Supply, optimal node placement, number of nodes, System security and reliability, BSN Architecture – Introduction

Unit II :Hardware For BAN

Processor-Low Power MCUs, Mobile Computing MCUs ,Integrated processor with radio transceiver, Memory ,Antenna-PCB antenna, Wire antenna, Ceramic antenna, External antenna, Sensor Interface, Power sources- Batteries and fuel cells for sensor nodes.

Unit III :Wireless Communication And Network

RF communication in Body, Antenna design and testing, Propagation, Base Station-Network

topology-Stand –Alone BAN, Wireless personal Area Network Technologies-IEEE 802.15.1,IEEE P802.15.13, IEEE 802.15.14, Zigbee

Unit IV :Coexistence Issues With BAN

Interferences – Intrinsic - Extrinsic, Effect on transmission, Counter measures- on physical layer and data link layer, Regulatory issues-Medical Device regulation in USA and Asia, Security and Self protection-Bacterial attacks, Virus infection ,Secured protocols, Self protection.

Unit V :Applications Of BAN

Monitoring patients with chronic disease, Hospital patients, Elderly patients, Cardiac arrhymias monitoring, Multi patient monitoring systems, Multichannel Neural recording, Gait analysis, Sports Medicine, Electronic pill

Textbooks :

1. Annalisa Bonfiglio, Danilo De Rossi ,"Wearable Monitoring Systems", Springer, 2011.(Unit I, II, III & V).

2. Sandeep K.S. Gupta,Tridib Mukherjee,Krishna Kumar Venkatasubramanian, "Body Area Networks Safety, Security, and Sustainability," Cambridge University Press, 2013. (Unit IV).

References:

1. Zhang, Yuan-Ting, "Wearable Medical Sensors and Systems",Springer, 2013.

2. Guang-Zhong Yang(Ed.), "Body Sensor Networks, "Springer, 2006.

3. Mehmet R. Yuce,Jamil Y.Khan, "Wireless Body Area Networks Technology, Implementation , and applications",Pan Stanford Publishing Pte.Ltd,Singapore, 2012.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7EL6	GSM	3	3	-	-

Unit I : GSM Architecture And Interfaces

Introduction, GSM frequency bands, GSM PLMN, Objectives of GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio Interface (MS to BSC), Abis interface (BTS to BSC), A Interface (BSC to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSl layers .

Unit II: Radio Link Features In GSM Systems

Introduction, Radio link measurements, Radio link features of GSM Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce Interface GSM, Channel borrowing, Smart antenna.

Unit III : **GSM Logical Channels And Frame Structure**

Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CC. multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification.

Unit IV: Speech Coding In GSM

Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CAll FLOWS IN GSM: Introduction, GSM PLMN services. GSM messages, MS-BS interface, as to MSC messages on the A interface, MSC to VLR and HLR, GSM cal setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Date interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

Unit V: Privacy And Security In GSM

Introduction, Wireless security requirements, Privacy of communications, Authentication

requirements, System lifetime requirements, Physical requirements, SIM cards, Secure, algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

Unit VI: Planning And Design Of A GSM Wireless Network

Introduction, Tele traffic models, Call model, Topology model, Mobility in cellular I PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints fOI hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

Unit VII: Management Of GSM Networks

Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobile management, Platform-centered management, SNMP, OSI systems management, NM Interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

Textbooks :

1. "Principles of Applications of GSM", Vijay K. Garg & Joseph E.Wilkes, Pearson education/ PHI, 1999

References:

1. GSM: Evolution towards 3rd Generation Systems, (Editor), Z.Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. GSM & UMTS: The Creation of Global Mobile Communication, Friedhelm Hillebrand, John Wiley & Sons; 2001

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7L01	Microwave Engineering Lab	1	-	-	2

List of Experiments:

1. Study of Microwave Components
2. To study the VI Characteristics of Gunn Diode using Gunn Oscillator
3. To determine the frequency and wavelength in a rectangular waveguide working on TE10 mode using Klystron power supply
4. To determine the frequency and wavelength in a rectangular waveguide working on TE10 mode by using Gunn Power Supply
5. To determine the Standing Wave Ratio ond Reflection Coefficient using Klystron
6. To determine the Standing Wave Ratio ond Reflection Coefficient using Gunn Oscillator
7. To measure the unknown impedance from smith chart using Gunn Power Supply
8. To measure an unknown impedance from smith chart using Klystron Power Supply
9. To measure the polar pattern and the gain of a waveguide from antenna
10. To study field intensity measurement of a Horn Antenna
11. To study field intensity measurement of a Parabolic Antenna

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7L02	Digital Signal Processing Lab	1	-	-	2

List of Experiments

A.USING MATLAB / SCILAB / OCTAVE /WAB

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

B. USING DSP PROCESSOR

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5. Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6. Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7. Impulse response of first order and second order system

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC8T01	Biomedical Instrumentation	3	3	-	-

Unit I: Human Anatomy & physiology

Bioelectric potentials, leads & electrodes Transducers for biological applications, biomaterials.

Unit II: Monitors and Recorders

bio-potential, amplifiers, recorders, monitors, Galvanometric, potentiometric, ultra voilet, electrostatic, ink jet recorders video monitors, color printers, Electro physiological recorders, ECG-working principles & clinical applications

Unit III : **Nervous system measurements**

Anatomy of Nervous system, Neurona communication, EPSP & IPSP, Neuronal firing measurements, ECG blocking diagram. Various Rhythms, EEG in diagnostics, EMG applications.

Unit IV: Ophthalmology Instruments

Electro retinogram, Electro oculogram Opthalmoscope, Tonometer for eye pressure measurement

Unit V : Therapeutic Instruments

Diathermy, Defibrillator, cardiac pacemakers stimulators,Laser applications in machine, X-Rays production & use, Radiographic Diagnostic and Therapeutic, Film construct on and processing, Interaction with body. Fundamentals of radiation therapy.

Textbooks:

1. Khandpur R.S,"Biomedical Instrumentation",TMH
2. Cormwell, "Biomedical Instrumentation and Measurements", PHI

References:

1. W.F. Ganong Review of Medical Physiology/8th Asian Edition Medical Publishers, 1977.
2. J.G. Webster (Ed) Medical Instrumentation Houghton Mifflin 1978.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC8T02	Digital Image Processing	3	3	-	-

Unit I: Introduction

Digital Image representation, fundamental steps in image processing, Elements of digital image processing systems.

Unit II :Digital Image Fundamentals

Elements of Visual perception, A simple Model, Image Sensing and Acquisition, Image Sampling and quantization, some basic relationships between pixels.

Unit III: Image Transformation and enhancement

Some basic Intensity Transformation functions, Histogram Processing, Smoothing and Sharpening Spatial Filters, Smoothing and Sharpening using Frequency Domain Filters.

Unit IV: Image Restoration

Degradation Model, Noise Models, Restoration in the presence of Noise – Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean square error filter.

Unit V :Image Segmentation

Point Detection, Line Detection, Edge Detection, Thresholding, Region – Based Segmentation, Color Image Processing.

Textbooks:

1. Digital Image Processing - Rafael C Gonzalez - Addison Wesley

References:

1. Digital Image Processing - Richard E Woods -'" Addison Wesley
2. Fundamentals of Digital Image Processing - A.K Jain – PHI

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC8EL7	Medical Imaging System	3	3	-	-

Unit 1: Ionizing Radiation

Radiation & interaction with matter , Radiation dosimetry, risk and protection , Radiation Biology

Unit 2: Radiography

Film-screen and digital , Mammography & Fluoroscopy

Unit 3: Ultrasound Imaging (US)

Principles of US ,Practice of US

Unit 4: Image Analysis

Image Analysis , Image Processing I- image types and linear transforms ,Image Processing II – frequency analysis , Fourier Filtering

Unit 5: Computed Tomography

Image reconstruction theory , Computed Tomography (CT) systems , ROC Analysis

Unit 6: Magnetic Resonance Imaging (MRI)

Principles of NMR , MR imaging , MR Imaging , MR pulse programming , MRS & fMRI , Applications of MR

Unit 7: Nuclear Medicine Imaging

Single Photon Emission Computed Tomography (SPECT) , Positron Emission Tomography (PET)

Unit 8: Imaging applications in Therapy

Radiation therapy treatment planning , Conformal therapy / Bracheytherapy

Textbook:

1. The Essential Physics of Medical Imaging, 2nd Edition, (2002) by J. T. Bushberg, J. A. Seibert, E. M. Leidholdt, J. M. Boone, Lippencott Williams & Wilkins Pulb. (Kluwer),

References:

1) The Physics of Medical Imaging, S. Webb, Institute of Physics Publishing, 1988.
2) Christensen's Physics of Diagnostic Radiology by Thomas S. Iii Curry, James E. Dowdey, Robert C., Jr Murry, Lea & Febiger Publishing, 4th edition, 1990.
3) Introduction to Radiological Physics and Radiation Dosimetry, F. H. Attix, John Wiley and Sons Publishing, 1986.
4) Medical Physics and Biomedical Engineering, B. H. Brown, R H Smallwood, D C Barber and D R Hose, Institute of Physics Publishing Ltd., 1999.
5) The Modern Technology of Radiation Oncology, J. van Dyk, Medical Physics Publishing, 1999. 6) Radiobiology for the Radiologist, Eric J. Hall, Lippincott Williams & Wilkins, 5th edition, 2000

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC8EL8	Wireless Sensor Network	3	3	-	-

Unit I: Overview Of Wireless Sensor Networks

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

Unit II : Architectures

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Unit III : Networking Sensors

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless, Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

Unit IV Infrastructure Establishment

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Unit V Sensor Network Platforms And Tools

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Textbooks:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

References:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC8EL9	Nano Technology	3	3	-	-

Unit I:

Introduction: why nanotechnology, limits of size reduction, Moore’s law. Physics of the solid state: structure, energy bands, and localized particles. Properties of individual nanoparticles:

introduction, semiconducting nanoparticles.

Unit II:

Carbon nanostructures: introduction, carbon molecules-nature of the Carbon Bond, new Carbon Structures, carbon clusters, carbon nanotubes, application of carbon nanotubes. CNTFET. Basic characterization equipment: AFM, STM.

Unit III:

Quantum Wells, Wires (nanowires), and Dots: Introduction, preparation of Quantum nanostructures, size and dimensionality effects, excitons, single electron tunneling. Cavity QED, NMR, Josephson junction, and Quantum dot devices.

Unit IV:

Nano fabrication Techniques: basic micro fabrication techniques: - lithography, thin film deposition and doping, etching and substrate removal, substrate bonding; nanofabrication techniques:- e-beam and nano imprint fabrication.

Textbook:

1.Charles P. Poole, Jr., Frank J Owens, Introduction to Nanotechnology, John Wiley and Sons Inc, 2003

References:

1. Bharat Bushan, Handbook of Nanotechnology, 2/e, Springer-Verlag Heidelberg, 2007.
2. K.E. Drexler, Nanosystems, John-Wiley Inc, 1992.
3. Morinubo Endo, Sumio Iijima, MS.Dresselhaus, Carbon Nanotubes, Pargamon, Elsevier Science, 1996.
4. Edward L Wolf, Nanophysics and Nanotechnology, Wiley-VCH Verlag, 2004.
5. S. D. Lyshevski, Nano- and Microelectromechanical Systems, CRC Press, 2001.

Subject Code	***Course name***	***Credits***	***L***	***T***	***P***
EC7EL10	Ad Hoc Wireless Networks	3	3	-	-

Unit I :AD HOC Networks

Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.

Unit II :MAC Protocols For AD HOC Wireless Networks

Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks,

Classification of MAC protocols.

Contention - based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols.

Unit III: Routing Protocols For AD HOC Wireless Networks

Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol. Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.

Unit IV: Transport Layer Protocols For AD HOC wireless networks Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks.

Unit V: Security

Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

Unit VI: Quality Of Service In AD HOC Wireless Networks

Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions.

Textbook:

1. "Ad hoc wireless Networks", C. Siva Ram Murthy & B. S. Manoj, Pearson Education,

2nd Edition, reprint 2005.

References

1. **"Ad hoc wireless Networks"**, Ozan K. Tonguz and Gianguigi Ferrari, Wiley
2. **"Ad hoc wireless Networking"**, Xiuzhen Cheng, Xiao Hung, Ding- Zhu Du, Kluwer Academic publishers

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7EL11	Network Security	3	3	-	-

Unit I : Introduction

Services, mechanisms and attacks, The OSI security architecture, A model for network security.

Unit II: Symmetric Ciphers

Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher.

Unit III: Cryptasystems

Principles of Public-Key Cryptasystems, The RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions.

Unit IV: Authentication

Digital signatures, Authentication Protocols, Digital Signature Standard.

Web Security Consideration, Security socket layer (SSL) and Transport layer security, Secure Electronic Transaction.

Unit V: Password Management

Intruders, Intrusion Detection, Password Management.

Unit VI: Malicious Software

Viruses and Related Threats, Virus Countermeasures.

Unit VII: Firewall

Firewalls Design Principles, Trusted Systems.

Textbook:

1. **Cryptography and Network Security**, William Stalling, Pearson Education, 2003.

References:

1. **Cryptography and Network Security**, Behrouz A. Forouzan, TMH, 2007.
2. **Cryptography and Network Security**, Atul Kahate, TMH, 2003.

Subject Code	*Course name*	*Credits*	*L*	*T*	*P*
EC7EL12	Fundamentals Of MEMS	3	3	-	-

Unit I :Introduction To Fabrication Techniques:

Basic fabrication techniques (lithography, thin film deposition and doping) MEMS fabrication techniques-Nano fabrication techniques (E-Beamnano-imprint fabrication, Epitaxy and strain engineering. Scanning probe techniques).

Unit II: Machining and Transport Property

Introduction to Micromachining and MEMS – Essential Technical background for lithography-based micromachining - Photolithography, vacuum systems, etching methods, deposition methods.

Unit III: MEMS Device Physics and Design

Critical understanding of various transduction principles

-Design, production, and characterization of MEMS devices - Sensing (piezoelectric, capacitive, magnetic, etc.) - Actuation (electrostatic, electromagnetic, thermal, piezoelectric, SMA, etc.) Layout and design rules Experimental Mechanics for Microelectromechanical

Systems (MEMS) - Methods, techniques.

Unit IV:Applications

Sensors, Actuators, and Signal Processing - Principles and performance of micro transducers - Design of experiments - Sensor and actuator spatial/temporal resolution, error analysis, uncertainty - propagation, and data acquisition - Applications of micro transducers for distributed real-time control of systems.

Textbooks:

1. J. A. Pelesko and D. H. Bernstein, *Modeling MEMS and NEMS*, CRC, 2002.
2. N. Cleland, *Foundations of Nanomechanics: From Solid-State Theory to Device Applications*. *Advanced Texts in Physics.* Berlin: Springer, 2003.

References :

1. V. Kaajakari, *Practical MEMS*, Las Vegas, Nevada: Small Gear, 2009.
2. Liu, *Foundations of MEMS. Illinois ECE Series*, Upper Saddle River, New Jersey: Pearson/Prentice Hall, 2006.