Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

1. Range for total credits in III, IV, V and VI semester is 22-28

2. A course on Management (PC), will be run in VII semester for four branches and the rest will have it in VIII semester

3. Course credits have been assigned as per **R & R 8.7** of UG Manual.

4. Advance elective courses which can also be M.Tech courses or advance courses designed and offered to the UG students by the department have been identified.

Categories: PC: Programme Core PE: Programme Elective AEC: Advanced Elective Course OE: Open Elective

First Year (Common to all Branches)

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	I/II	ECT 101	Basic Electronics Engineering	PC	Theory	4	3-1-0
2	I/II	ECP 102	Electronics Engineering Lab	PC	Lab	2	0-0-3

Semester III

SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	III	ECT 201	Electronic Devices & Circuits	PC	Theory	3	3-0-0
2	III	ECT 202	Switching Theory & Finite Automata	PC	Theory	3	3-0-0
3	III	ECT 203	Network Theory	PC	Theory	3	3-0-0
4	III	ECT 204	Probabilistic Methods in Signals & System	PC	Theory	3	3-0-0
5	III	ECT 205	Graph Theory	PC	Theory	2	2-0-0
6	III	ECT 206	Data Structures & Algorithms	PC	Theory	3	3-0-0
1	III	ECP 201	Electronic Devices & Circuits Lab	PC	Lab	2	0-0-3
2	III	ECP 202	Switching Theory & Finite Automata Lab	PC	Lab	2	0-0-3
3	III	ECP 204	Data Structures & Algorithms Lab	PC	Lab	2	0-0-3
4	III	ECP 206	Probabilistic Methods in Signals & System	PC	Lab	2	0-0-3

DUGC Convener Head, ECE SUGB Chairman

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

Semester IV SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	IV	ECT 211	Applied Electronics	PC	Theory	3	3-0-0
2	IV	ECT 212	Analog Communication	PC	Theory	3	3-0-0
3	IV	ECT 213	Microprocessors	PC	Theory	3	3-0-0
4	IV	ECT 214	Electromagnetic Field Theory	PC	Theory	3	3-0-0
5	IV	ECT 215	OPERATING SYSTEMS	PC	Theory	3	3-0-0
6	IV	ECT 216	Measurements & Instrumentation	PC	Theory	3	3-0-0
1	IV	ECP 211	Applied Electronics Lab	PC	Lab	2	0-0-3
2	IV	ECP 212	Analog Communication lab	PC	Lab	2	0-0-3
3	IV	ECP 213	Microprocessors lab	PC	Lab	2	0-0-3
4	IV	ECP 215	Operating Systems Lab	PC	Lab	2	0-0-3
						26	

Semester IV SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	V	ECT 301	Microwave Engineering	PC	Theory	3	3-0-0
2	V	ECT 302	Digital Signal Processing	PC	Theory	4	3-0-2
3	V	ECT 303	Digital Communication Systems	PC	Theory	3	3-0-0
4	V	ECT 304	Digital CMOS IC	PC	Theory	4	3-0-2
5	V	ECT 305	Optical Communication Systems	PC	Theory	4	3-0-2
6	V	ECT 306	VLSI Testing & Testability	PC	Theory	3	3-0-0

1	V	ECP 301	Microwave Engineering Lab	PC	Lab	2	0-0-3
2	V	ECP 303	Digital Communication Systems Lab	PC	Lab	2	0-0-3
						25	

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

Semester VI SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	VI	ECT 311	Antenna & Wave Propagation	PC	Theory	4	3-0-2
2	VI	ECT 312	Computer Architecture	PC	Theory	3	3-0-0
3	VI	ECT 313	Wireless & Mobile Communication	PC	Theory	3	3-0-0
4	VI	ECT 314	Control System Engineering	PC	Theory	3	3-0-0
5	VI	ECT 315	Embedded Systems	PC	Theory	3	3-0-0
6	VI	ECT 316	Analog CMOS IC	PC	Theory	3	3-0-0

1	VI	ECP 316	Analog CMOS IC lab	PC	Lab	2	0-0-3
2	VI	ECP 317	Embedded Systems Design Lab	PC	Lab	2	0-0-3
3	VI	ECS 318	SEMINAR	PC	Lab	2	0-0-3

25

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

Semester VII

SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	VII		Management*	PC	Theory	3	3-0-0
2	VII		FROM LIST*	OE	Theory	3	3-0-0
3	VII		FROM LIST*	OE	Theory	3	3-0-0
4	VII		FROM AEC LIST*	PE	Theory	3	3-0-0
5	VII		FROM PE LIST	PE	Theory	3	3-0-0
6	VII		FROM PE LIST	PE	Theory	3	3-0-0
7	VII		FROM PE LIST	PE	Theory	3	3-0-0
1	VII	ECD 481	Training Seminar	PC	Lab	2	0-0-3
2	VII	ECD 483	System Design Lab-I	PC	Lab	2	0-0-3
3	VII	ECD 498	Major Project A	PC	Project	4	0-0-8

23

Semester VIII

SUM should be in the range 22-28

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	VIII		Management*	PC	Theory	3	3-0-0
2	VIII		FROM LIST*	OE	Theory	3	3-0-0
3	VIII		FROM LIST*	OE	Theory	3	3-0-0
4	VIII		FROM AEC LIST*	AEC	Theory	3	3-0-0
5	VIII		FROM AEC LIST	AEC	Theory	3	3-0-0
6	VIII		FROM AEC LIST	AEC	Theory	3	3-0-0
7	VIII		FROM AEC LIST			3	3-0-0
1	VIII	ECD 482	System Design Lab-II	PC	Lab	2	0-0-3
2	VIII	ECD 499	Major Project B	PC	Project	8	0-0-16

25 Total=***149***

Indicates that the courses individually, may be opted either in 7th Semester OR 8th Semester

Note: * Programme elective and advanced elective course are taken as it is from PG (M.Tech.) courses running in the ECE department. Therefore, please refer the same for the syllabus and other details for PG courses.

DUGC Convener Head, ECE SUGB Chairman

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

LIST OF PE/AEC: (3 credits each)

ECT 401	SPREAD SPECTRUM TECHNOLOGY
ECT 403/ECT663	Advanced ERROR CONTROL CODES
ECT404/ECT 670	SATELLITE COMMUNICATION & RADAR ENGINEERING
ECT 405	IMAGE PROCESSING
ECT 406/ECT607	CAD ALGORITHMS FOR VLSI PHYSICAL DESIGN
ECT 407/ECT 603	CAD ALGORITHMS FOR SYNTHESIS OF DIGITAL SYSTEMS
ECT 408/ECT 616	COMUPTER ARITHMETIC & MICROARCHITECTURE DESIGN
ECT 409/ECT622	SYSTEM LEVEL DESIGN & MODELLING
ECT 411	NEURAL NETWORKS
ECT 412	ADVANCED MICROPROCESSORS & MICRO-CONTROLLERS
ECT 413	COMPUTER NETWORKS
ECT 451/ECT665	ADV. MICROWAVE ENGG
ECT 452/ECT676	Design of MICROSTRIP ANTENNA
ECT 453	ADVANCED ANTENNA SYSTEMS
ECT 454	MICROWAVE INTEGRATED CIRCUITS
ECT 455	POWER ELECTRONICS
ECT 456	SEMICONDUCTOR OPTO-ELECTRONICS
ECT 457/ECT 628	MEMORY DESIGN & TESTING
ECT 459/ECT640	ELECTRONIC MANUFACTURING TECHNOLOGY
ECT 460/ECT 626	FORMAL VERIFICATION OF Digital HARDWARE & EMBEDDED Software
ECT 462	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM
ECT 463	PARALLEL COMPUTING ARCH
ECT 464	BIO-MEDICAL ENGINEERING
ECT 465/ECT658	CURRENT-MODE ANALOG SIGNAL PROCESSING
ECT 466/ECT 655	OPTICAL CODES AND APPLICATIONS
ECT 467/ECT 656	ADAPTIVE SIGNAL PROCESSING
ECT 468/ECT 657	VLSI SIGNAL PROCESSING Architectures
ECT470	Human Values -I
ECT478/ECT 642	FPGA PHYSICAL DESIGN
ECT479/ECT 614	VLSI TECHNOLOGY
ECT480	Information Theory & Coding
ECT481	System Design using FPGAs
ECT482	Instrumentation & Control

LIST OF PE/AEC: (3 credits each)

ECT 672	WIRELESS AND MOBILE ADHOC NETWORKING
ECT 674	CRYPTOGRAPHY
ECT 678	DESIGN OF MIC AND MMIC'S
ECT 680	ADVANCED MOBILE SYSTEMS
ECT 682	SMART AND PHASED ARRAY ANTENNA DESIGN
ECT 684	ADVANCED TOPICS IN COMMUNICATION
ECT 686	PHOTONIC INTEGRATED DEVICES AND SYSTEMS
ECT 688	EMI/EMC
ECT 690	WIRELESS SENSOR NETWORK
ECT 692	COMPUTATIONAL ELECTROMAGNETIC
ECT 694	ADVANCED PHOTONIC DEVICES AND COMPONENTS
ECT 696	TELECOMMUNICATION TECHNOLOGY AND MANAGEMENT
ECT 698	ADVANCED NETWORKING ANALYSIS
ECT 662	ADVANCED DIGITAL SIGNAL & IMAGE PROCESSING
ECT 620	MICROELECTRONIC DEVICES AND CIRCUIT
ECT 630	ADVANCED COMPUTER ARCHITECTURE
ECT 634	MICRO AND NANO ELECTRO MECHANICAL SYSTEMS
ECT 638	DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUITS
ECT 664	ESTIMATION AND DETECTION
ECT 650	SPECIAL TOPICS IN VLSI-1
ECT 652	SPECIAL TOPICS IN VLSI-2
ECT 654	RF INTEGRATED CIRCUITS
ECT 991	MATHEMATICAL METHODS & TECHNIQUES FOR ECE TECHNOLOGIES I
ECT 992	MATHEMATICAL METHODS & TECHNIQUES FOR ECE TECHNOLOGIES II

ECT 993 Pattern Recognition and Machine Learning

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

Example-1 **Semester VII** Student goes on INTERNSHIP in 7th Sem SUM should be in the range 18-20

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	*VII*		*Management**	*PC*	*Theory*	*3*	*3-0-0*
5	*VII*		*FROM PE LIST*	*PE*	*Theory*	*3*	*3-0-0*
6	*VII*		*FROM PE LIST*	*PE*	*Theory*	*3*	*3-0-0*
7	*VII*		*FROM PE LIST*	*PE*	*Theory*	*3*	*3-0-0*
2	*VII*	*ECD 483*	*System Design Lab-I*	*PC*	*Lab*	*2*	*0-0-3*
1	VII	ECD 481	Training Seminar	PC	Lab	2	0-0-3
3	VII	ECD 498	Major Project A	PC	Project	4	0-0-8
						0	

Exempted as per UG manual (16 credits max) End of 8th Sem

Semester VIII SUM should be in the range 18-20

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1							
2	VIII		FROM LIST	OE	Theory	3	3-0-0
3	VIII		FROM LIST	OE	Theory	3	3-0-0
4	VIII		FROM AEC LIST	AEC	Theory	3	3-0-0
5	VIII		FROM AEC LIST	AEC	Theory	3	3-0-0
6	VIII		FROM AEC LIST	AEC	Theory	3	3-0-0
7	VIII		FROM AEC LIST			3	3-0-0
1	VIII	ECD 482	System Design Lab-II	PC	Lab	2	0-0-3
2	VIII	ECD 499	Major Project B+ evaluation ONLY for A	PC	Project	8	0-0-16
						20	

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

Example-2

Semester VII SUM should be in the range 18-20

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
1	VII		Management	PC	Theory	3	3-0-0
4	VIII		FROM LIST	OE	Theory	3	3-0-0
	VIII		FROM LIST	OE	Theory	3	3-0-0
5	VII		FROM PE LIST	PE	Theory	3	3-0-0
6	VII		FROM PE LIST	PE	Theory	3	3-0-0
7	VII		FROM PE LIST	PE	Theory	3	3-0-0
2	VII	ECD 483	System Design Lab-I	PC	Lab	2	0-0-3
1	VII	ECD 481	Training Seminar	PC	-	2	0-0-3
3	VII	ECD 498	Major Project A	PC	Project	4	0-0-8
						20	

Semester VIII Student goes on INTERNSHIP in 8th Sem SUM should be in the range 18-20

S.No.	Semester	Course Code	Course Name	Category	Type	Credit	L-T-P
3	*VIII*		*FROM AEC LIST*	*OE*	*Theory*	*3*	*3-0-0*
5	*VIII*		*FROM AEC LIST*	*AEC*	*Theory*	*3*	*3-0-0*
6	*VIII*		*FROM AEC LIST*	*AEC*	*Theory*	*3*	*3-0-0*
7	*VIII*		*FROM AEC LIST*	*AEC*	*Theory*	*3*	*3-0-0*
8	*VIII*	*ECD 482*	*System Design Lab-II*	*PC*	*Lab*	*2*	*0-0-3*
9	VIII	ECD 499	Major Project B (evaluation ONLY)	PC	Project	8	0-0-16
						22	

Exempted as per UG manual (16 credits max)

Indicates that the courses individually, may be opted either in 7th Semester OR 8th Semester

DUGC Convener Head, ECE SUGB Chairman

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (First Year)

Course Code : ECT-101 **LTP: 3-0-1 per week**	**Course : Basic Electronics Engineering** **Credits: 03**

Syllabus: Module I: Analog Electronics

Diode Circuits: Introduction to diodes, Current components in diode, Zener diode and applications. Half -wave and full -wave rectifiers & their analysis, comparison of bridge and center -tap rectifier, various types of RLC filters, clipping & clamping circuits. Introduction and working principles of LED and Solar cell. **(9)**

Transistors: Bipolar Junction Transistor, Current components in transistor, transistor construction, various configurations (CE, CB. CC) and characteristics (Input and Output) of BJT's configurations. The transistor as an amplifier and switch, Introduction to MOSFETs, Construction, characteristics and working principles of MOSFETs (depletion type MOSFET and Enhancement type MOSFET). **(7)**

Operational Amplifiers: Introduction, ideal and practical operational amplifiers, open and closed loop configurations, Applications of operational amplifiers**.** **(4)**

Module II: Digital Electronics

Digital Gates and Functions: Introduction to number systems and binary arithmetic, Logic Gates and universal gates, Boolean algebra, SOP & POS forms of a Boolean function, simplification of logical functions using Karnaugh map. **(6)**

Digital Circuits: Half and full adder, subtractor, multiplier, encoders, decoders, multiplexers, demultiplexers. **(4)**

Module III: Communication Systems

Principles of communication systems, Concepts of modulation and demodulation, AM, FM, PM.

Course Outcomes: At the end of the course the student will be able to:

CO1- understand the essential basic electronics principles for analysis and design of diodes and related circuits.
CO2-learn the working of different type of transistors, simple transistor circuits and applications.
CO3-understand the fundamental working and applications of operational amplifiers
CO3-learn the basics of Boolean algebra, function minimization and elementary digital circuits.
CO4-understand the fundamental concepts of analog communication systems

References:

1. Basic Electronics and linear Circuits, N N Bhagava, TMH
2. Integrated Electronics, Millman Halkias, TMH.
3. Electronic Devices and Circuit, David A. Bell, Oxford
4. Electronic Devices and Circuit Theory, R. L. Boylestad, Pearson Education
5. Digital Circuits and Design, S Salivahanan, Vikas Publishers
6. Digital Electronics, Moris-Mano, PHI
7. An Introduction to Analog & Digital Communications, Simon Haykin, Michael Moher, Wiley
8. Fundamentals of Communication Systems, John G Proakis, Pearson Education

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-201 **LTP: 3-0-1 per week**	**Course : Electronic Devices & Circuits** **Credits: 03**

Syllabus:

Transistor at low frequencies: Graphical Analysis of the CE configuration, Two-Port devices and the hybrid Model, Transistor hybrid model, The h-parameter, Conversion formulas for the parameters of the three transistor Configuration, Analysis of a transistor Amplifier Circuit using h parameters, The Emitter follower, Comparison of transistor amplifier configurations, Linear Analysis of a Transistor Circuit, Cascading Transistor Amplifiers, Simplified Common-Emitter Hybrid Model, Simplified calculations for the Common Collector Configuration, The Common-Emitter Amplifier with an emitter resistance, High input resistance transistor circuits, Multistage amplifier analysis.

Field Effect Transistors: The FET and MOSFET Small-Signal model, The Low-Frequency Common-Source and Common-Drain Amplifiers, The FET as a Voltage-variable Resistor (VVR). High frequency model of BJT: High frequency hybrid-π model of BJT, Common emitter and common collector configurations, Cascade configuration.

Feedback Amplifiers: General Feedback structure, Properties of negative Feedback, Four basic Feedback Topologies, Voltage series, Voltage shunt, Current series, Current Shunt, Effect of Feedback connection on various parameters. Analysis of above topology for BJT and FET.

Oscillators: Basic principle of sinusoidal oscillator (phase shift, wein bridge), Hartley & Colpitts, Crystal Oscillator, nonlinear/pulse oscillator.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Acquire basic knowledge on the working of various semi-conductor devices

CO2- Develop analysis capability in BJT and FET Amplifier Circuits

CO3: Develop competence in frequency response analysis of discrete amplifiers

CO4: Develop design competence in signal and power amplifiers using BJT and FET

References:

1. Electronic principles, Bolysted
2. Millman, Halkias, Integrated Electronics- Analog & digital circuits, TMH.
3. Millman, Halkias & S. Jit. Electronics Devices & Circuits, TMH, 2009.
4. Microelectronic Circuits, Sedra Smith, Oxford press, India.
5. Electronic Devices and Circuits, David-A-Bell, Oxford Univ. Press 2008.

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-202 **LTP: 3-0-0 per week**	**Course : Switching Theory and Finite Automata** **Credits: 03**

Syllabus:

Number System and Codes: Arithmetic of Nonconventional Number System, Weighted Codes, Error Correction/Detection Codes, BCD codes, Fixed point & floating point Number System

Boolean Algebra and Logic Gates: SOP and POS for Truth Table, K'Maps, Tabular method, NAND/NOR Universal Gates, Hazardous in the circuits

Combination Circuits: Adders, Magnitude comparators, Encoder/Decoders, Muxes/DeMuxes, BCD Adder, Logic Implementation using combination blocks

Sequential Circuits: FlipFlops, Master-Slave FlipFlop, Type of Counters (Synchronous/Asynchronous), Types Registers, FSM concept, Examples of FSM, Simplification of incompletely specified Machines.

PLD Concept and Implementation: Basics of HDL (VHDL/Verilog) , Syntax and Semantics of HDL, Design Style using HDL, Basics of PAL,PLA, PROM, CPLD, FPGA

Course Outcomes:

CO1 Is able to understand the arithmetic of nonconventional number systems (knowledge)

CO2:To understand the concept of Boolean algebra (knowledge)

CO3:To design basic digital circuit using HDL concept (skills)

CO4:Understand the concept of combination and sequential circuit (skills)

CO5: To implement FSM design for various real world applications (skills)

References:

1. Digital Design by Morris Mano
2. Switching Theory and Finite Automata by Zvi Kohvi
3. VHDL : Programming By Example Author : Douglas L. Perry

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-203 **LTP: 3-0-0 per week**	**Course : Network Theory** **Credits: 03**

Syllabus:

Methods of Network Analysis: Mesh and node variable analysis; Star Delta transformation; Steady state analysis of AC circuits, Characteristics of the sinusoid: Average, peak and effective values, Impedance concept, Active, reactive and complex power, Power factor, Q of coils and capacitors, Series and parallel resonances, Series Parallel reduction of AC/DC circuits, Network Theorems.

Two Port Networks: Parameters: open circuit impedance Z parameters, short circuit admittance Y parameters, Hybrid h parameters, Chain parameters ABCD and g parameters, Image Impedances, T and pie network, Relationship between different two port network, Interconnection of two-port network: cascade, series, parallel, series-parallel and parallel-series connections, Indefinite admittance matrix and applications.
Network Graphs: Network Matrices, Incidence and Reduced Incidence matrix, Loop Matrix, Fundamental loop matrix, Cut set and cut set matrix, Fundamental cut set matrix, Relationship between network Matrices, Formulation of network equations, Fundamental loop equations and nodal admittance matrix.
Steady State & Transient Analysis: DC and sinusoidal response of R-L-C circuits, Laplace transforms and its properties, inverse transforms, initial and final value theorems, use of transfer function in network analysis. State Equations for Networks: Basic consideration in writing state equations, order of complexity, Formulation of state equations, Solutions of state equations, State transition matrix. Frequency domain analysis of RLC circuits, Poles & Zeros, Driving Point Function, Amplitude & Phase Response.
Passive Filters: Classification, Constant-K filters, m-Derived T-Section, Band pass filter, Band elimination filter, Tunable filter realization.

Course Outcomes:

CO1: Is able to apply different networking theorems to solve network problems.
CO2: Is able to compute methods of network matrixes, Incidence and reduced incidence matrix, loop matrix etc.
CO3: Is able to perform two port networks as Z parameter, ABCD parameter, T parameter, Y parameter etc.
CO4: Is able to analyses transient & steady states, formulate state equations and find solutions of state equations.
CO5: Is able to analyses networks in frequency domain, pole-zero plots, amplitude and phase response
CO6: Is able to design basic passive filters

References:

1) M. E. Valkenburg, Network Analysis, PHI, 1995
2) S. Ghosh, Network Theory: Analysis and Synthesis, PHI, 2005
3) T. S. K. Iyear, Circuit Theory, TMG Hill, 1985
4) Del Toro, Principles of Electrical Engg, PHI, 1994
5) A. Sudhakar & Shyammohan S. Palli, Circuits & Networks: Analysis & Synthesis, McGraw Hill, 2015

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-204 **LTP: 3-0-0 per week**	**Course : Probabilistic Methods in Signals & System** **Credits: 03**

Syllabus:

Probability Theory & Random Variables : Introduction to theory of probability, Self, joint & conditional probabilities, Statistically dependent & independent events, Discrete and continuous Random Variables (RV's) , their CDF's and pdf's

Functions of random variable: Case of one/two random variables, Joint RVs, Mean values and moments of some pdf's (Binomial, Poisson, Gaussian, Rayleigh, Maxwell, Gaussian), Correlation function and their properties, Basic concept of Random processes

Representation of Signals and Systems: Continuous & discrete time signals, LTI systems and their classification, System modeling using differential and difference equations.

Analysis of signals: Fourier series, Fourier transforms and their properties, Convolution, Transmission of signals through linear systems

Fourier Analysis for DTS: Discrete time Fourier series, Discrete time Fourier transform and their properties, DFT and its properties, Fast Fourier Transform Z-transforms & its properties, ROC, Inversion of Z-transform, Application to System Analysis.

Course Outcomes:

On completion of the course, student will be able to

CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.

CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.

CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.

CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop

CO5: the ability to analyze the system in s- domain.

CO6: Understand the basic concept of probability, random variables & random signals and develop and the ability to find correlation, CDF, PDF and probability of a given event.

References:

1. Cooper, McGillem: Probabilistic Methods of Signal and System Analysis, 3/e, OUP, 1999.
2. Peebles, P.: Probability, random variables and random signal principles, Mc Graw Hill, 2001.
3. Haykin S.: Communication Systems, 2/e, Student Edition, Wiley India, 2007.
4. Oppenheim A.V., Willsky A.S. and Nawab S.H..: Signals and Systems, 2/e, Prentice Hall of India, 1997
5. B.P. Lathi, Modern Digital and Analog. Communication Systems, 3rd ed., Oxford. University Press, 1998.

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-205 **LTP: 3-0-0 per week**	**Course : Graph Theory** **Credits: 02**

Syllabus:

Graph- basics, Planarization, triangulation, graph algorithms for shortest/longest paths, spanning tree, search etc.

Algorithms & complexity- shortest path, max-flow, Dijkshtra's algorithm, min-cost flow, algorithm for graph search and matching; spanning trees and matroids;

Integer Linear programming, Greedy algorithm, approximation algorithms; branch-and-bound; dynamic programming

Course Outcomes:

CO1. Is able to grasp core concepts, basic tenets of combinatorial graphs, special graphs (Cognitive- Understand)

CO2. Is able to grasp and analyze features, properties of graph entities e.g. cutset, tree, chord-set, cycles etc (Cognitive- Analyze)

CO3. Is able to learn & apply graph algorithms and its applications into Circuits, computer problem solving etc. (Skills- Analyze)

CO4. Is able in long perspective, to appreciate the significance of GRAPH as a versatile modeling entity; and the significance that it can be used for analysis, problem solving as well as synthesis- especially for chip design, wireless communication protocols & system design, computer problem solving, data structures etc. (Affective/Skills- Evaluate)

CO5. Is able to write small C/C++ programmes related to implementation of graph algorithms (Skills- Apply)

References:

1. Narsingh Deo, Graph theory, Prentice Hall India, 2008.
2. T. H. Cormen, C. E. Leiserson and R. L. Rivest, "Introduction to Algorithms," McGraw-Hill, 2007
3. S. Baase, Computer algorithms, Pearson India 2008.

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-206 **LTP: 3-0-0 per week**	**Course : Data Structures and Algorithms** **Credits: 03**

Syllabus:

Introduction to data structures: Static and dynamic aspects of memory allocation. Recursion and its applications. Introduction to complexity analysis, measure and representation.
Algorithms for searching and Sorting: Non-recursive and recursive implementation of searching. Non-recursive and recursive sorting algorithms.

Creation and manipulation of data structures: arrays, stacks, queues and linked lists with static and dynamic memory allocation. Applications. Creation, manipulation and analysis of trees. Binary search tree algorithms.

Graph problems: Shortest path implementation. Introduction to Max Flow-Min Cut and travelling salesman problem.
Introduction to height balanced trees: AVL and B Trees.

Course Outcomes:

CO1: grasp core concepts of space & time complexity analysis (Cognitive, understanding)
CO2: analyze & design basic algorithms for sorting, searching etc. (Skills, Evaluate)
CO3: analyze & solve for computing the order of time complexity of algorithms (Skills, Analyze)
CO4: able to learn and code for various search algorithms like divide & conquer, branch & bound, greedy (skills, Apply)
CO5: able to appreciate & write code for various mathematical & algebraic computations- FFT, matrix multiplication, pattern matching, graph algorithms (Cognitive, Apply)
CO6:appreciate the significance of polynomial as well as NP complete problems, and solution thereof as approximation algorithms (Cognitive, Analyze).

References:

1. Kruse R.L., Data Structure and Program Design, PHI.
2. Rivest, Cormen, Introduction to Algorithms, MIT Press
3. Horowitz and Sahni: Data Structure in C++ , Glagotia
4. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures
5. Aaron M. Tenenbaum, Y. Langsam, Moshe J. Augenstein, Data Structures Using C

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-211 **LTP: 3-0-0 per week**	**Course : Applied Electronics** **Credits: 03**

Syllabus:

Waveform Generators: Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator. Schmitt trigger.

Operational Amplifiers: The Ideal Op Amp, Inverting Configuration, Non inverting Configuration, Applications of Op Amps, Circuits. Effect of Finite Open loop gain and Bandwidth on circuit Performance, Large signal Operation of Op Amps, Practical operational Amplifier parameters. Feedback.

Power Amplifiers: Power Amplifier Circuits. Class A, Class B and Class AB output stages Class A, Class B Push pull amplifiers with and without Transformers.

Voltage Regulators: Basic series and shunt regulator, IC voltage regulator, short circuit or overload protection, Application of IC voltage regulator. Phase locked loop(PLL): Block diagram, working and its various applications

Recent advances in operational amplifiers.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understanding different modes of Schmitt trigger
CO2: Implementing circuits with Operational amplifier
CO3: Understanding different types of power amplifiers
CO4: Applying the voltage regulator in different configuration
CO5: Understanding PLL and its usage

References:

1. Sedra/Smith, Microelectronic Circuits, Oxford University Press.
2. L. Schilling and C. Belove, Electronic Circuits, McGraw-Hill.
3. S. Soclof, Applications & Design with analog IC's PH1
4. Jacob-Applications & Design with analog IC's, PH1
5. Coughlin Driscol-Operational Amplifiers & Linear IC's Pearson Education.
6. Millman, Halkias & Parikh. Integrated Electronics- Analog & digital circuits, TMH, 2009.
7. Current literature from reputed journals

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-212 **LTP: 3-0-0 per week**	**Course : Analog Communication** **Credits: 03**

Syllabus:

Spectral density: Transmission of signals through linear systems, ideal filters, Hilbert transform, pre-envelope, complex envelope,

Amplitude Modulation: AM, Double Side Band Suppressed Carrier modulation, Single Side Band modulation, Vestigial Side Band modulation, AM receivers, Noise in AM receivers using envelope detection, SNR for coherent reception with SSB and DSBSC modulations, Frequency Division Multiplexing.

Angle modulation: Frequency modulated & Phase modulated signals, Frequency Modulation, Narrow Band and Wide Band Frequency Modulation, Multitone FM, De-emphasis in FM, Noise in FM reception,

Pulse Analog Modulation: Pulse Amplitude Modulation, Pulse time Modulation, Time Division multiplexing, Elements of Pulse Code modulation , Differential PCM, Delta Modulation, Adaptive Delta Modulation.

Time- and Frequency Characterization of Signals and Systems: The Magnitude-Phase Representation of the Fourier Transform Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency-Selective Filters. Time- Domain and Frequency-Domain Aspects of Nonideal Filters. First-Order and Second-Order Continuous and Discrete-Time Systems, Discrete-Time Processing of Continuous-Time Signals, Sampling of Discrete-Time Signals.

Course Outcomes:

CO1:Gain the knowledge of components of analogue communication system.
CO2: To analyze various methods of baseband/band pass Analogue transmission and detection.
CO3:Analyze and allocate performance objectives to components of an analogue communication system and to design analogue communication systems.
CO4: To evaluate the performance of analogue communications in the presence of noise.

References:

1. Haykin S.: Communication Systems, 2/e, Student Edition, Wiley India, 2007.
2. Oppenheim A.V., Willsky A.S. and Nawab S.H..: Signals and Systems, 2/e, Prentice Hall of India, 1997
3. Tan: Digital Signal Processing; Fundamentals and application, Elsevier
4. B.P. Lathi, Modern Digital and Analog. Communication Systems, 3rd ed., Oxford. University Press, 1998.
5. J.G. Proakis and M. Salehi, Communication Systems Engineering, 2nd Edition.

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-213 **LTP: 3-0-0 per week**	**Course : Microprocessors** **Credits: 03**

Syllabus:

Introduction to 8085 Microprocessor: Block diagram, pins & their description, demultiplexing of buses, control signals & flags. Introduction to 8085 based microcomputer system.
Instruction & Timings: Instruction classification, instruction formats, addressing modes, Instruction timings and status.
Programming & Programming Techniques of the 8085: 8085 instruction set, data transfer instructions, arithmetic, logic & branch operations. Rotate & compare. Instructions related to stack operations. Looping, counting and indexing, counters & time delays.
Stack and Subroutines: Concept of stack in 8085 and its uses. Subroutines implementation in 8085 assembly language.
Interfacing Concepts: Basic interfacing concepts. Memory Interfacing. Memory mapped and peripheral mapped I/O. Interrupts in 8085 and their features. A/D and D/A converters. Interfacing A/D and D/A converters.
Programming & interfacing of Support ICs: Interfacing of 8155, 8255, 8279 with 8085.
Introduction to other support chips: Introduction of 8253 and 8259A with 8085 microprocessor. Direct memory Access: Basic concepts of DMA techniques and introduction DMA controller 8257.

Course Outcomes:

At the end of the course the student will be able to:

CO1: recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.

CO2: identify a detailed s/w & h/w structure of the Microprocessor.

CO3: illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.

CO4: distinguish and analyze the properties of Microprocessors.

CO5: analyze the data transfer information through serial & parallel ports.

CO6: train their practical knowledge through laboratory experiments.

References:

1. J.L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson, 1999.
2. Barry B. Brey, The Intel Microprocessors, (7/e), Eastern Economy Edition , 2006.
3. M.A. Mazidi & J.C. Mazidi Microcontroller and Embedded systems using Assembly & C. (2/e), Pearson Education,

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-214 **LTP: 3-0-0 per week**	**Course : ELECTRO-MAGNETIC FIELD THEORY (EMFT)** **Credits: 03**

Syllabus:

Unit I Introduction: Vector Relation in rectangular, cylindrical and spherical coordinate system. Concept and physical interpretation of gradient, Divergence and curl. Green's and Stokes theorems.

Unit II Steady Electric Field: Coulomb's Law, units, Electric field intensity, Relation between E and V, Electric flux and flux density, Gauss law, Boundary conditions: Dielectric-dielectric, Conductor – dielectric, Conductor-free space, scalar and vector potential, electric field in dielectric and conductor, Laplace and Poisson's equations, continuity equation, uniqueness theorem, energy stored in electric fields, equivalence theorem, method of image and numerical solution, energy storage and their applications

Unit III Magnetic field due to steady currents, force between current carrying wires, Ampere's circuit law, Bio-Savart's Law, Magnetic flux density, Stokes theorem, Magnetic static and Vector potential, magnetization vector and its relation to magnetic field, Magnetic boundary condition. Analogy between electric and magnetic fields

Unit IV Time Varying Fields, Faraday's law, Displacement currents and equation of continuity, their physical interpretation, Maxwell's equations, integral & differential form of Maxwell's equation, Time varying fields.

Unit V Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection of UPW, standing wave ratio. Potentials vector and power considerations.

Course Outcomes:

At the end of this course, students will be able to:

CO1 Apply vector calculus to static electro-magnetic fields in different engineering situation.
CO2 Describe static and dynamic electric and magnetic fields.
CO3 Use boundary conditions for electric and magnetic fields.
CO4 Understand Maxwell equations in different form and apply them to diverse engineering problems.
CO5 Analyze the behaviour of plane waves in different media.
CO6 Examine the phenomenon of wave propagation and reflection in different media.

References:

1. Elements of Electromagnetics- Matthew N.O. Sadiku, Oxford University Press.
2. Electromagnetics- J.D. Kraus,Tata McGraw Hill
3. Electromagnetic Waves & Radiating Systems- E.C. Jordan & K.G. Balmain, Prentice Hall.
4. Fields and Wave Electromagnetics- David K. Cheng, Pearson.
5. Engineering Electromagnetics-W. H. Haytt, Tata McGraw Hill

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-215 **LTP: 3-0-0 per week**	**Course : Operating Systems** **Credits: 03**

Syllabus (contents will be elaborated in lecture schedule) -

Introduction: H/W, S/W and Firmware, Process concepts, operations on processes, suspend and resume, interrupt.

Deadlock and Indefinite Postponement:- Conditions of deadlock, deadlock prevention and avoidance, deadlock detection and deadlock recovery.

Storage management:- Storage management & hierarchy, various strategies, storage allocation, Fixed and variable partitioning, Virtual storage concepts, Block mapping, Paging, Segmentation, Virtual storage management, Page replacement strategies, locality, Demand Paging, Program behaviour.

Processor Management:- Job and Processor scheduling, Preemptive and Non-preemptive scheduling, FIFO, RR, SJF, SRT, HRN, etc scheduling techniques.

Auxiliary Storage Management:- Seek optimization, systems considerations, RAM disks, optical disks, File system, blocking & buffering, File organization, backup and recovery, CD-ROMs, Worm, database OS Security:- security requirements, external, password, security kernels, Fault-tolerant systems, cryptography, OS penetration, Worms & Viruses.

Case Studies:- UNIX systems, MS-DOS systems and Windows Architecture.

Course Outcomes:

CO1:To understand the objectives , structures and functions of modern operating systems To understand the working of processes and threads and their scheduling algorithms
CO2:To understand the problems of synchronization and deadlock in OS and its various solutions To understand the memory and storage handling/allocation methods
CO3:To understand files, its structures, implementation and protection issues
CO4:To analyze the problems related to OS and suggest viable solutions (analytically and design issues)

References:

1. Operating system concept--Silberschatz and Galvin- John wiley Operating system - Stalling by phi /pearsoned
2. Operating system -Tannenbaum by phi /pearsoned
3. An introduction to Operating Systems - H.M. Deitel ,Addison-Wesley Operating system - Godbole (TMH)
4. Operating system- Damdhare (TMH)

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-216 **LTP: 3-0-0 per week**	**Course : Measurements and Instrumentation** **Credits: 03**

Syllabus:

Measurements: Errors & classification.

Analog Ammeters and Voltmeters: PMMC and MI Instruments, Construction, Torque Equation, Range Extension, Effect of temperature,

Analog Wattmeters and Power Factor Meters: Electrodynamometer type wattmeter, power factor meter, Construction, torque equation, active and reactive power measurement in single phase and in three phase.

Analog Energy Meter: Single phase induction type energy meters, construction, Operation, lag adjustments, Max Demand meters/indicators, Measurement of VAH and VARh.

DC and AC Bridges: Measurement of resistance (Wheatstone Bridge, Kelvin's Bridge, Kelvin's Double Bridge), Measurement of inductance, Capacitance (Maxwell's Bridge, Desauty Bridge, Anderson Bridge, Schering Bridge, Wien Bridge).

Instrument Transformers: Current Transformer and Potential Transformer - construction, operation, phasor diagram, errors, testing and applications.

Transducers: Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Tachometer.

Electronic Instruments: Electronic Display Device, Digital Voltmeters, CRO, measurement of voltage and frequency, Wave Analyzers, Harmonic Distortion Analyzer.

Course Outcomes:

CO1: To understand the working principle of different measuring instruments.
CO2: Analyse the MC, MI and Dynamometer types of measuring instruments, Watt-meters and Energy-meters
CO3: Determine the values of components of circuits using AC and DC bridges
CO4: To know about transformers and transducers for the measurement of temperature, strain and speed

References:

1. J. B. Gupta: A course in Electrical and Electronic Measurements and Instrumentation, 13/E, Kataria and Sons, 2009.
2. U. A. Bakshi, A. V. Bakshi: Electrical Measurements and Instrumentation, Technical Publications, 2009.
3. A. K. Sawhney: A course in Electrical Measurements Electronic Measurements Instrumentation, Edition 11, Dhanpat Rai and Sons, 1996.
4. W.D. Coopers and Helfrick, Modern Electronic instrumentation and Measurements Techniques, Prentice Hall of India Pvt. Ltd, 2002.
5. E.W. Gowlding and F.C.Widdis, Electrical Measurements and Measuring Instruments 5/e, Wheeler Publications 1998.

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-301 **LTP: 3-0-0 per week**	**Course : MICROWAVE ENGINEERING** **Credits: 03**

Syllabus:

Unit I Introduction of Microwave Electromagnetic spectrum. Microwave signal propagation, Applications of Microwave and Microwave hazards. Transmission line, smith chart

Unit II Review of Maxwell's equation, Rectangular waveguides, characteristics of TE and TM wave in rectangular wave guides, Dominant mode in rectangular waveguide, Introduction to Cylindrical waveguides, waveguide excitation.

Unit III Microwave resonator, Microwave Network representations. Scattering matrix. S-Matrix for two, three & four port networks such as E-plane tee, H-plane tee, Magic tee, directional coupler and other microwave components.

Unit IV Transit time effect, Tubes for very high frequency limitation of conventional tubes, Reflex klystron, two cavity klystron, Magnetron, Travelling Wave Tube.

Unit V Measurement of VSWR, impedance, frequency, dielectric constant power, attenuation and phase shift.

Course Outcomes:

After the completion of this course students will be able to:

CO1. Evaluate various parameters of transmission lines

CO2. Analyze modes and dominant mode in rectangular waveguide and cylindrical waveguide.

CO3. Explain and evaluate performance of multiport microwave networks

CO4. Design isolator, basic microwave amplifiers, particularly klystrons, magnetron, basic RF oscillator and mixer models.

CO5. Compute the measurement parameters such as VSWR, impedance, frequency, dielectric constant power, attenuation and phase shift etc related to microwave circuits

References:

1. Introduction to Microwaves -Wheeler G.J., Prentice-Hall
2. Microwave circuits & passive devices- Sisodia and Raghuvanshi, New Age International.
3. Microwave engineering-David M. Pozar, John Wiley & Sons, Inc.
4. Microwave Devices and Circuits- Samuel Y. Liao, Prentice Hall
5. Microwave and Radar Engineering- Kulkarni, McGraw Hill Education

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-302 **LTP: 3-0-0 per week**	**Course : Digital Signal Processing** **Credits: 03**

Syllabus:

Z-Transform, Inverse Z-Transform, Properties of the Z-Transform, Inversion of the Z-Transforms (by Power Series Expansion, by Partial-Fraction Expansion), Analysis of Linear Time-Invariant Systems in the z-Domain, Response of Systems with rational System Functions, Transient and Steady-State Responses, Causality and Stability.

Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform, The DFT as a Linear Transformation, Relationship of the DFT to other Transforms, Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Additional DFT Properties, Linear Filtering Based on DFT.

FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT Algorithms: Decimation-In-Time (DIT), Decimation-In-Time (DIF); Applications of FFT Algorithms: Use of the FFT Algorithm in Linear Filtering and Correlation.

Structure for the Realization of Discrete-Time Systems, Structure for FIR Systems: Direct-Form Structure, Cascade-Form Structures, Structure for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures.

Design of FIR Filters, Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method; Design of IIR Filters from Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation

Course Outcomes:

CO1 : The basic objective of the course is to introduce and familiarize some important & useful signal processing techniques such as convolution, Fourier & Z-transform, filter design, structures for FIR and IIR systems.

CO2 : Students will develop programming skills for implementing signal processing algorithms using MATLAB.

References:

1.Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson.
2. Digital Signal Processing by A. V. Oppenheim and R. W. Schafer, PHI.
3. Principles of Signal Processing and Linear Systems by B.P. Lathi, Oxford.
4. Digital Signal Processing: A MATLAB-Based Approach by Vinay K. Ingle and John G. Proakis, Cengage Learning.
5. Fundamentals of Digital Signal Processing using MATLAB by Robert J. Schilling and Sandra L. Harris, Cengage Learning.

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-303 **LTP: 3-0-0 per week**	**Course : Digital Communication Systems** **Credits: 03**

Syllabus:

Line Codes: On-Off (RZ), Polar (RZ), Bipolar (RZ), on-off (NRZ),-Polar (NRZ) & their Power spectrum density (PSD), HDB coding, B8ZS signaling.

Baseband Pulse transmission: Inter-symbol Interference (ISI) & its Reduction. Techniques, Nyquist criterion for distortionless baseband binary transmission, correlative coding, eye pattern.

Digital Passband transmission: BPSK, BFSK, QPSK, QAM, MSK and M-ary, PSK, M-ary FSK transmitter and receiving systems and their detection , Probability of error, Power spectra, Matched filter. Introduction to Link Budget Analysis.

Spread spectrum Techniques: Spread Spectrum Overview, PN Sequences, DS-spread spectrum & Frequency- hop spread spectrum systems and their analysis, Introduction to W-CDMA and multiuser detection.

Course Outcomes:

Co1- Understanding of different types of modulation and demodulation techniques for digital communication

Co2- To learn the ISI and equalization techniques.

Co3-To analyse different types of channel coding schemes.

Co4-Understanding the performance of different digital communication systems

References:

1) Modern Digital & Analog Comm. systems 3/e B.P. Lathi; Oxford
2) Principles of Comm. Systems., Taub & Schilling, McGraw Hill publications.
3) Digital Comm.- By Proakis (TATA McGraw Hill) publications.
4) Digital Comm.-By Sklar (Pearson Education)
5) Comm. System 3/e Simon Haykin, Wiley Eastern Ltd.

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-304 **LTP: 3-0-1 per week**	**Course : Digital CMOS ICs** **Credits: 04**

Syllabus:

Introduction to MOSFETs technology: Construction and working of MOSFET, Current-Voltage Characteristics, Performance metrics for digital design, Scaling of MOSFETs, Fabrication flow of CMOS n-well process. [05h].

CMOS Inverter: Design , analysis of NMOS inverter (resistive, enhancement and depletion load) , CMOS inverters; transfer characteristics, Noise margins, , rationing of transistor size, logic voltage levels, rise and fall of delays, Propagation Delay, Power Consumption. [8h].

Combinational Circuits: Design of basic gates in NMOS technology; CMOS logic design styles: static CMOS logic (NAND, NOR gates), complex gates, Pass Transistor logic, Transmission gate, Dynamic MOS design: pseudo NMOS logic, clocked CMOS (C2 MOS) logic, domino logic, NORA, Half and Full adder), Multiplexer, XOR, XNOR [10h].

Logical Effort: Logical effort of different digital circuit design: Input capacitance, Logical and Electrical effort, parasitic delay, Single stage and Multistage with and without branch network. Design of minimum delay and optimization of best stages. [6h]

Layout and stick diagram: Layout design rules: Lambda and micron based design rules- stick diagram, Layer properties of various conducting layers in MOS and CMOS technology (diffusion, poly-silicon and metal), Layout design of different CMOS circuit, area estimation. [6h]

Sequential and Memory Design: Sequential MOS Logic and Memory Design: Static latches; Flip flops & Register. [5h]

Project: Introduction of open source tools: EDA. The class project is to design reasonably complex CMOS circuit. The project will be performed as a team of three or four students.

Course Outcomes:

Co1- Understanding of different types of modulation and demodulation techniques for digital communication

Co2- To learn the ISI and equalization techniques.

Co3-To analyse different types of channel coding schemes.

Co4-Understanding the performance of different digital communication systems

References:

1. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design, Second Edition, McGraw-Hill, 1999.
2. Rabaey, Chandrakasan and Milokic. Digital system design- A design perspective. Pearson education, India.
3. Neil H.E.Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, A System Perspective, Pearson Education, India. 4. Ken Martin, Digital Integrated Circuits, Oxford Press.
4. CMOS Circuit Design, Layout and simulation: J. Baker, D.E. Boyce., IEEE press.

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-305 **LTP: 3-0-2 per week**	**Course : Optical Communication Systems** **Credits: 04**

Syllabus:

Fundamentals of fiber optics: Ray propagation, waveguiding in optical fibers, step index and graded index fibers, Modes in optical fiber, mono mode & multimode fibers, fiber fabrication, dispersion relations. Signal degradation: Dispersion, attenuation & scattering in fibers, link analysis.

Fiber Measurement: Measurement of fiber attenuation, bandwidth, power, & cut-off wavelength, OTDR.

Opto electronic devices:- Light source materials, LEDs, Lasers, Photo-diodes, PIN diodes etc. Modulation capability. Photodetectors, PIN photodiode and Avalanche photodiodes,

Power launching and coupling: Fiber joints, cables and connectors, fiber splices, optical coupler and optical measurements.

Analog and Digital optical transmission systems: Link Analysis, system design considerations for point-topoint links, noise sources in optical communication, system architecture. WDM, Coherent optical systems. Methods of modulation, Heterodyne and Homodyne systems, Noise in coherent systems, Multichannel coherent systems, Optical amplifiers, Introduction to lightwave networks

Course Outcomes:

At the end of the course the student will be able to:

CO1: Distinguish Step Index, Graded index fibers and compute mode volume.

CO2: Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.

CO3: Classify the construction and characteristics of optical sources and detectors.

CO4: Discuss splicing techniques, passive optical components and explain noise in optical system.

CO5: Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems.

References:

1. Fiber Optics and Optoelectronics – R.P. Khare
2. Optical Communication-VK Jain, Franz
3. Optical Communication - Keiser
4. Optical fiber communication - J.M. Senior

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-306 **LTP: 3-0-0 per week**	**Course : VLSI Testing &Testability** **Credits: 03**

Syllabus:

Introduction to Digital Testing: Introduction, Test process and Test economics,- Functional vs. Structural Testing Defects, Errors, Faults and Fault Modeling (Stuck at Faults, Bridging Faults, transitor fault, delay fault), Fault Equivalence, Fault Dominance, Fault Collapsing and Checkpoint Theorem

Fault Simulation and Testability Measures: Circuit Modelling and Algorithms for Fault Simulation, Serial Fault Simulation, Parallel Fault Simulation, Deductive Fault Simulation, Concurrent Fault Simulation, Combinational SCOAP Measures and Sequential SCOAP Measures, Critical Path Tracing

C**ombinational Circuit Test Pattern Generation:** Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algebras, Standard ATPG Algorithms, D-Calculus and D-Algorithm, Basics of PODEM Random, Deterministic and Weighted Random Test Pattern Generation; Aliasing and its effect on Fault Coverage.

PLA Testing, Cross Point Fault Model and Test Generation. Memory Testing- Permanent, Intermittent and Pattern Sensitive Faults

Sequential Circuit Testing and Scan Chains: ATPG for Single-Clock Synchronous Circuits, Use of Nine-Valued Logic and Time-Frame Expansion Methods, Complexity of Sequential ATPG, Scan Chain based Sequential Circuit Testing, Scan Cell Design, Design variations of Scan Chains, Sequential Testing based on Scan Chains, Overheads of Scan Design, Partial-Scan Design Controllability and Observability Scan Design, BILBO , Boundary Scan for Board Level Testing ; BIST and Totally self checking circuits

Self Repairing circuits and BIST: Introduction to BIST architecture BIST Test Pattern Generation, Response Compaction and Response Analysis, Memory BIST, March Test, BIST with MISR, Neighbourhood Pattern Sensitive Fault Test, Transparent Memory BIST, Totally self checking circuits, Concept of Redundancy, Spatial Redundancy, Time Redundancy, Error Correction Codes. Recent trends in VLSI Testing and Testability

Course Outcomes: At the end of the course the student will be able to:

CO1: Distinguish Step Index, Graded index fibers and compute mode volume.
CO2: Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.
CO3: Classify the construction and characteristics of optical sources and detectors.
CO4: Discuss splicing techniques, passive optical components and explain noise in optical system.
CO5: Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems.

References:

1. Abramovici, M., Breuer, M. A. and Friedman, A. D. Digital systems testing and testable design. IEEE press (Indian edition available through Jayco Publishing house), 2001.
2. Bushnell and Agarwal, V. D. VLSI Testing. Kluwer.
3. Agarwal, V. D. and Seth, S. C. Test generation for VLSI chips. IEEE computer society press.
4. Hurst, S. L. VLSI testing: Digital and mixed analog/digital techniques. INSPEC/IEE, 1999
5. https://nptel.ac.in/courses/106103116/handout/mod7.pdf
6. http://ece-research.unm.edu/jimp/vlsi_test/slides/html/overview1.htm, http://www.cs.uoi.gr/~tsiatouhas/CCD/Section_8_1-2p.pdf, Latest

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-311 **LTP: 3-0-0 per week**	**Course : Antenna & Wave Propagation** **Credits: 03**

Syllabus:

Antennas: Antenna fundamentals and definitions, Effective length, Effective aperture, gains, bandwidth, beamwidth, radiation resistance, input impedance, Polarization, Pattern, reciprocity Theorem.

Antenna Arrays: Collinear, broadside, endfire and Binomial, Dolph-Tschebyscheff arrays. Multiplication of Patterns.

UHF & Microwave Antennas: Parabolic reflector, Horn, Lens antennas, Yagi, Log-periodic, Helical Antennas, Square & Circular loop antennas.

Microstrip antennas: Rectangular Patch, Circular Patch antennas & their analysis (End results only) Arrays & feed networks.

Radio Wave Propagation: Theory of Ground wave, Space wave & Sky wave Propagation, Various ionospheric Layers. Effect of ground constants on wave propagation, Duct Propagation, Tropospheric scattering, Critical frequency, Skip zone, MUF in sky wave propagation, Effect of Earth's, Magnetic field Atmospheric Conditions, Solar activity.

Radio wave Propagation in Mobile Environments: Free space, Ground Reflection models, Knife-edge diffraction model & Okumura models; Indoor propagation models.

Course Outcomes:

At the end of the course the student will be able :

1) To learn the fundamentals of antenna and its characteristics.
2) To understand the concepts of Antenna Arrays, UHF & Microwave Antennas, Microstrip antennas.
3) To understand the radio wave propagation techniques.
4) To understand the free space communication, Reflection models, Diffraction model & Indoor propagation models.

References:

1. Antennas Theory & Practice- By Balani
2. Antennas & wave Propagation - By K.D. Prasad
3. Wireless Communications: Principles & Practice - By Theodore S. Rappaport

DUGC Convener Head, ECE SUGB Chairman

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-312 **LTP: 3-0-0 per week**	**Course : Computer Architecture** **Credits: 03**

Syllabus:

Syllabus (contents will be elaborated in lecture schedule) -

Single processor- basics of microprocessors,CPU control unit, Register Transfer and Micro-operations, assembler and Instruction set pipeline architecture. 16-bit, 32-bit /64-bit RISC and CISC processors ISA and assembly programming.

Memory organization- memory hierarchy, main memory, associative memory, cache memory, virtual memory, memory management .

Input-output organization- peripheral devices . Bus interface. Data transfer techniques. Direct memory access. I/O interrupts.

Multiprocessors- characteristics of microprocessors. Interconnection structures. Interprocessor arbitration. Digital computer arithmetic- fixed point addition,subtraction, multiplication and division. Decimal arithmetic. Floating point arithmetic.

Course Outcomes:

At the end of the course the student will be able to:
CO1:To understand the working of basic processor
CO2:To describe the 16,32,64-bit processors ISA (CISC and RISC)
CO3:To understand the memory and its management in computer system
CO4:To understand I/O interface and multiprocessor interconnect and other issues
CO5:To learn the arithmetic(fixed and floating point) algorithms and equivalent circuits
CO6:To write assembly programmes and design memory and arithmetic ckts. (analytically and design issues)

References:

1. Computer System Architecture-M. Morris Mano (PHI)
2. Computer Architecture- A quantitative approach (ARM ed) -Hennessy , Patterson (PHI) Computer Organization -V. Carl. Hamacher (TMH)
3. Computer Organization and Architecture -John P Hayes (McGraw -Hill) Computer Organization and Architecture – William Stallings (Pearson)
4. Computer System Organization-A. S. Tanenbaum (PHI).

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-313 **LTP: 3-0-0 per week**	**Course : : Wireless and Mobile Communication** **Credits: 03**

Syllabus:

Cellular System Design Fundamentals: Components of Mobile Cellular Systems, Frequency Reuse Concepts, Cell design, Co channel Interference, Channel Assignment Strategies, Handoff strategies, Network Control, System operation, Call origination & Termination, Interference & System Capacity, Improving Capacity in cellular systems, **Small Scale Fading & Multipath Propagation:** Impulse response model of a multipath channel, Doppler shift, Multipath measurements, Parameters of mobile multipath channels, Types of small-scale fading,

Multiple Access Techniques for Wireless Communication- FDMA, TDMA, SDMA, CDMA, Diversity Techniques.

Course Outcomes:

At the end of the course the student will be able to:

CO1:Appreciate and familiarize the world of mobile communications.

CO2:Develop requisite mathematical background for mobile systems using teletraffic theory, probability theory and stochastic processes as well as linear algebra.

CO3:Design parts of mobile communication system using mathematical models.

CO4:Develop proficiency in the subject by working on individual term papers and presenting their study to the entire class (Presentation Sessions).

References:

1. Wireless Communications: Principles & Practices by Theodore S. Rapport.
2. Mobile Cellular Telecomm. B y William C. Y. Lee.
3. Mobile Communication by Schiller, (Pearson Education India.)

DUGC Convener Head, ECE SUGB Chairman

Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-314 **LTP: 3-0-0 per week**	**Course : Control Systems Engineering** **Credits: 03**

Syllabus:

Concept of open loop and closed loop control systems. Examples and applications of open loop and closed loop systems.

Representation of physical system (Electro-Mechanical) by differential equations. Determination of transfer function by block diagram reduction technique and signal flow graph method.

Time response analysis of first order and second order system: Transient response analysis, steady state error and error constants.

Absolute stability and relative stability. Routh's stability criterion, Root locus method of analysis.

Frequency domain method; Bode plot and Nyquist stability criterion.

Representation of state equations, Relationship between state equations and differential equations and transfer functions, solution of state equations, state transition matrix, state transition equation. Controllability and observability of control systems.

Course Outcomes:

At the end of the course the student will be able to:

CO1- Ability to analyze the operation and modeling of closed loop feedback systems

CO2- Ability to analyze and compensate the steady- state and transient response of the systems.

CO3- Ability to investigate the stability of control systems

CO4- Ability to analyze control system using state variable technique.

References:

1) I.J. Nagrath & M. Gopal : Control Systems Engineering, III Edition, NAI Pub.
2) Katshuhiko Ogata : Modern Control Engineering, III Edition, PHI.
3) Banjamin C. Kuo : Automatic Control Systems, VII Edition, PHI.

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-315 **LTP: 3-0-0 per week**	**Course : Embedded Systems** **Credits: 03**

Syllabus:

Embedded computing- Microprocessors, embedded design process, system description formalisms. Instruction sets- CISC and RISC;

CPU fundamentals- programming I/Os, co-processors, supervisor mode, exceptions, memory management units and address translation, pipelining, super scalar execution, caching, CPU power consumption. Embedded computing platform- CPU bus, memory devices, I/O devices, interfacing, designing with microprocessors, debugging techniques.

Program design and analysis- models of program, assembly and linking, compilation techniques, analysis and optimization of execution time, energy, power and size.

Processes and operating systems- multiple tasks and multiple processes, context switching, scheduling policies, inter-process communication mechanisms.

Hardware accelerators- CPUs and accelerators, accelerator system design. Networks- distributed embedded architectures, networks for embedded systems, network-based design, Internet-enabled systems.

System design techniques- design methodologies, requirements analysis, system analysis and architecture design, quality assurance.

Course Outcomes: At the end of the course the student will be able to:

CO1: Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems..

CO2: Become aware of the architecture of the ATOM processor and its programming aspects (assembly Level)

CO3: Become aware of interrupts, hyper threading and software optimization.

CO4: Design real time embedded systems using the concepts of RTOS.

CO5: Analyze various examples of embedded systems based on ATOM processor.

References:

1. Wolf, W. Computers as components- Principles of embedded computing system design. Academic Press (Indian edition available from Harcourt India Pvt. Ltd., 27M Block market, Greater Kailash II, New Delhi-110 048.)

2. Vahid and T. Givargis. Embedded System Design: A Unified Hardware/Software Introduction , Wiley, 2002.

3. Furber, ARM System-on-Chip Architecture, Pearson

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Curriculum structure of B.Tech ECE Programme

(Department of Electronics & Communication Engineering)

SYLLABUS OF B. Tech. (ECE)

Course Code : ECT-316 **LTP: 3-0-0 per week**	**Course : Analog CMOS ICs** **Credits: 03**

Syllabus:

Physics of MOS Transistors: Review of current equation, regions of operation, small signal model.

Amplifiers: Common Source, Source follower, Common Gate and Cascode amplifiers, Biasing Techniques.

Current Mirror: Basic Current Mirrors, Cascode Current mirror.

Differential Amplifier: Basic differential Pair, common mode response, CMRR, Differential Pair with MOS load, Active load, Cascode differential amplifier.

Frequency Response of Amplifiers: Miller Effect, Association of Poles with nodes, Frequency Response of all single stage amplifiers.

Feedback: Topologies, Stability and Compensation.

Two Stage OpAmp

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understand the operation of MOSFET and its small signal model. (Cognitive- Understanding)

CO2: Analyze and design amplifiers, current mirrors and differential amplifiers. (Skills- Analyze)

CO3: Understand the significance of different biasing techniques and apply them aptly to different circuits. (Cognitive- Understanding)

CO4: Comparatively evaluate the frequency response of different single stage amplifiers (Cognitive- Analyze)

CO5: Analyze & design the compensation method of amplifiers for stability.(Skills- Evaluate)

References:

1. Behzad Razavi, Fundamentals of Microelectronics, Second edition, Wiley, 2013,
2. Sedra and Smith, Microelectronics Circuits, Oxford Univ. Press, 2004, Johns and Martin, Analog Integrated Circuit Design, John Wiley & Sons, 2002 AND Allen Holberg, CMOS Analog Integrated Circuit Design: Oxford University Press, 2002.