B.TECH. 4 YEAR PROGRAMME

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME

(3rd & 4th Semester)

Third Semester (B.Tech. - ECE)

Course No.	Subject	Scheme of Studies Periods per Week			Credits
		L	T	P	
MTH 211	Mathematics III	3	1	-	4
EC 211	Electronic Devices & Circuits	2	1	2	4
EC 212	Digital Logic Design	2	1	2	4
EC 213	Network Analysis and Synthesis	2	1	2	4
EC 214	Signals and Systems	3	1	-	4
EC 216	Electronic Workshop-I	-	-	4	2
Total L=12, T=5, P =10				Total Credit	22

Fourth Semester (B.Tech. - ECE)

Course No.	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
EC 221	Linear Integrated Circuits	3	1	-	4
EC 222	Microprocessors and Microcontrollers	2	1	2	4
EC 223	Analog & Digital Communication	2	1	2	4
EC 224	Database Management System	2	1	2	4
EC 225	Probability Theory and Random Process	3	1	-	4
EC 226	Electronic Workshop-II	-	-	4	2
NC	Community Services*	-	-	-	-
Total L=12, T=5, P =10				Total Credit	22

Community Services*: 15 days (100 Hrs) community services such as Swach bharat Abhiyan.

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SYLLABUS III – SEMESTER

Course Name: Mathematics-III **Code: MTH 211**

Numerical Methods: Solution of algebraic and transcendental equations, Solution of linear Simultaneous Equations.

Finite Differences, Interpolation formula for equal and unequal intervals, Central Difference formula, Inverse Interpolation, Numerical Differentiation.

Numerical Integration, Numerical solution of Ordinary & Partial Differential Equations.

Statistics: Curve fitting, Correlation and Regression Analysis Probability Statistics: Curve fitting, Correlation and Regression Analysis Discrete and Continuous Random Variables, Probability Density Functions.

Theoretical Distributions, Binomial, Poisson Normal Distributions etc. Hypothesis Testing-Testing of Statistical Hypothesis and its Significance (Chi-Square, t, z and F Tests).

Text/ Reference Books:

1. Numerical Analysis S S Sastry

2. Numerical Analysis B S Garewal

3. Numerical Analysis Jain Ayenger Jain

4. Mathematical Statistics M. Ray

5. Head first Statistics Gujarati

Course Name: Electronic Devices and Circuits **Code: EC 211**

Modeling devices: Static characteristics of ideal two terminal and three terminal devices; Small signal models of non-linear devices. Introduction to semiconductor equations and carrier statistics: poisson's and continuity equations, Fermi-Dirac statistics and Boltzmann approximation to the Fermi-Dirac statistics.

Semiconductor Diodes: Barrier formation in metal semiconductor junctions, PN homo-and hetero- junctions; CV characteristics and dopant profiling; IV characteristics; Small signal models of diodes; Some Applications of diodes.

Field Effect Devices : JFET/HFET, MIS structures and MOSFET operation; JFET characteristics and small signal models; MOS capacitor CV and concept of accumulation, depletion and inversion; MOSFET characteristics and small signal models.

Bipolar transistors : IV characteristics and elers-Moll model; small signal models; Charge storage and transient response. Discrete transistor amplifiers: Common emitter and common source amplifiers; Emitter and source followers.

Text/ Reference Books:

1. D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997.
2. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
3. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.
4. J. Millman and A. Grabel, Microelectronics, McGraw Hill, International, 1987.
5. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
6. R.T. Howe and C.G. Sodini, Microelectronics : An integrated Approach, Prentice Hall International, 1997.

<u>Electronics Circuit Lab Experiments</u>

1. Study of BASIC ELECTRONICS COMPONENTS
2. Study of CRO, FUNCTION GENERATOR, MULTIMATE, D.C. POWER Supply
3. Study and plot Diode Characteristics of Si.
4. Study and plot Diode Characteristics of Ge.
5. Study and plot Bipolar Junction Transistor (BJT) Characteristics in CE configuration.
6. Study and plot Bipolar Junction Transistor (BJT) Characteristics in CB configuration.
7. Study and plot Bipolar Junction Transistor (BJT) Characteristics in CC configuration.
8. Study and plot Field Effect Transistor (FET) Characteristics.
9. Study and plot Metal Oxide Field Effect Transistor (MOSFET) Characteristics.
10. Study and plot Uni-Junction Transistor (UJT) Characteristics.
11. Design Half wave rectifier using diode.
12. Design Full wave rectifier using diode.
13. Design Clipper using diode.
14. Design Clamper using diode.
15. Study of PCB and layout.

Course Name: Digital Logic Design **Code: EC 212**

Number system, simplification of Boolean expressions, minimization techniques, Karnaugh map, Quine Mc–clusky method, combinational circuits design, Flip flops, sequential circuits design, Registers, Introduction of Logic families

References:

1. Digital Logic and Computer Design — M.Morris Meno, Pearson Education
2. Digital Fundamentals — Floyd and Jain, Pearson Education
3. Digital Electronics Principles and integrated Circuits — A.K.Maini, Wiley India.
4. Modern Digital Electronics — RP Jain
5. Fundamentals of digital circuits — A Anand Kumar, PHI

<u>Digital Electronics - Lab Experiments</u>

1. Experiment to study and implement all the logic gates and to verify their outputs.
2. Experiment to study and implement NAND gate as universal gate.
3. Experiment to study and implement NOR gate as universal gate.
4. Experiment to study and implement XOR gate.
5. Experiment to study and implement binary code conversion to grey code conversion.
6. Experiment to study and implement grey code to binary code conversion.
7. Experiment to study and implement HALF-ADDER circuit.
8. Experiment to study and implement FULL-ADDER circuit.
9. Experiment to study and implement HALF –subtractor circuit.
10. Experiment to study and implement JK-Flip Flop.
11. Experiment to study about the working of multiplexer and its operation as a logic level generator.
12. Study of logic gates using ICs and discrete components.
13. Verify 8:1 MUX and 1:8 DEMUX
14. Study of RAM using IC 7489
15. Study of CMOS Inverter
16. Interface CMOS to TTL and viceversa
17. Study of FFs – RS, D, T and JK
18. Study of decade counter IC 7490
19. Study of 4-bit ripple counter IC 7493
20. Study of shift register IC 74194/195
21. Study of 4-bit comparator IC – 7485
22. Working project made by the student at the end of Lab.

Course Name: Network Analyses and Synthesis **Code: EC 213**

Circuit elements, fundamental laws, Maxwell's loop and nodal analysis, Network theorems with independent and dependent source, Effect of mutual inductance, coupled circuit, Graph theory, Time response analysis by time domain and frequency domain methods, calculation of initial conditions, Wave synthesis, Fourier Series representation, Two port network, Network function, Positive real function, Hurwitz polynomial, Network Synthesis using Foster and Cauer first and second forms.

Reference Books:

1. Network Analysis by M. E. Van Valkenburg, Pearson
2. Network Analysis and Synthesis by Franklin F. Kuo, Wiley
3. Circuits, Devices and Systems by Smith and Dorf, Wiley
4. Network analysis and Synthesis by Pankaj Swarnkar, Satya Prakashan
5. Electric Circuits by M. Nahavi and J A Edminister, Schaum's Outlines

Network Lab Experiments

1. Study of Superposition Theorem
2. Study of cascaded 2 port network
3. Study of Reciprocity Theorem
4. Study of Tellegans theorem
5. Network theorems (superposition, Norton's, thevinins, maximum power transfer)
6. Study of Millman's theorem
7. Study of maximum power transfer theorem
8. Network theorem (Norton's & thevinins)

Course Name: Signals and Systems **Code: EC 214**

Classification of signals and systems, various system representation techniques, Fourier transforms and series, application to analysis of systems, Laplace transform its properties and applications to system analysis, Linear Time Invariant (LTI) systems and their properties, Random variables and random process, characterization of random variables and random process, random signals.

Text/ Reference Books:

1. Signals and Systems — A.V. Oppenheim, A.S. Willsky and I.T. Young.
2. Analog and Digital Signal Processing — Ashok Ambardar
3. Signals and Systems — Simon Haykin, Barry Van Veen
4. Digital Signal Processing: Principles Algorithms & Applications — John G. Prokis
5. Signals and Systems — A. Anand Kumar

Course Name: Electronics Workshop-I **Code: EC 216**

Handling and measurement of Electronics Instruments, safety measures in electronics labs, Analysis for electronics components using data sheets, design of small electronics circuits, Basics of testing and calibration, Assembling an electronic circuit on PCB and testing.

References:

1. Robust Electronics Devices, vol 1, John r Barries, Kluwer Academic Publisher
2. Electronics, Engineer Reference Book, 6th edition, Elsevier Publication
3. Encyclopedia of electronics components charl platt, vol 1

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SYLLABUS IV – SEMESTER

Course Name: Linear Integrated Circuits **Code: EC 221**

Introduction to operational amplifiers: The difference amplifier and the ideal operational amplifier models, concept of negative feedback and virtual short ;Analysis of simple operational amplifier circuits; Frequency response of amplifiers, Bode plots.

Feedback: Feedback topologies and analysis for discrete transistoramplifiers; stability of feedback circuits using Barkhausen criteria. Linear application operational amplifiers: Instrumentation and Isolation amplifiers; Current and voltage sources; Active filters. Non-linear applications of operational amplifiers: Comparators, clippers and clampers;Linearization amplifiers; Precision rectifiers; Logarithmic amplifiers, multifunction circuits and true rms convertors.

Waveform Generation: sinusoidal feedback oscillators; Relaxation oscillators, square-triangle oscillators. Real operational amplifiers: Current sources and active loads, difference, intermediate and output stages including Miller capacitors for frequency computation; Operational amplifier parameters; Effects of real operational amplifier parameters on circuit performance.
Analog and Digital interface circuits: A/D, D/A Converters, S/H circuits and multiplexers.

Text/ Reference Books:

1. Introduction to Operational Amplifier theory and applications	J.V. Wait, L.P. Huelsman and GA Korn, 2nd edition, McGraw Hill, New York, 1992.
2. Microelectronics	J. Millman and A. Grabel, 2nd edition, McGraw Hill, 1988.
3. The Art of Electronics	P. Horowitz and W. Hill, 2nd edition, Cambridge University Press, 1989.
4. Microelectronic Circuits	A.S. Sedra and K.C. Smith Saunder's College Publishing, 1991.

<u>Linear Integrated Circuits Lab Experiments</u>

1. **CE , CB , CC Amplifiers.**
   - To measure the voltage gain and plot the frequency response characteristics of CE Amplifier.
   - To measure the voltage gain and plot the frequency response characteristics of CC Amplifier.
   - To measure the voltage gain and plot the frequency response characteristics of CB Amplifier.
2. **Transistor Biasing methods.**
   - To measure voltage gain for Fixed bias condition of the transistor.
   - To measure voltage gain for Collector Base bias condition of the transistor.
   - To measure voltage gain for Emitter Base bias condition of the transistor.

3. **Narrow Band Amplifier.**
    - To measure the voltage gain of the Narrow Band Amplifier.
4. **Push Pull Amplifier.**
    - To measure the voltage gain(AV) of the class B push pull Amplifier.
    - To find out the Power gain of the class B push pull Amplifier.
5. **Wide Band Amplifier.**
    - To measure voltage gain of Wide Bnad Amplifier and observe its bandwidth.
6. **MOSFET Amplifier.**
    - To measure the voltage gain of the MOSFET Amplifier.
7. **Thermal Stability of Transistor.**
    - First connect the given connector has shown.
    - Now increase the different values of transistor parameters as given.
    - Measure Ve , Vc , Vb , Vbe , Ic of transistors and note down.
    - Now increase the temperature of transistors of some degree and measure the above value again and make the conclusion according to theory of thermal stability.
8. **Negative Feedback Amplifier.**
    - To measure the voltage gain of the amplifier with or without feedback.
    - To plot frequency response with and without feedback for transistor amplifier.

Course Name: Microprocessors and Microcontrollers **Code: EC 222**

Microprocessors (8085) - internal architecture, Instruction set and assembly language programming. Introduction to 8086 microprocessor, internal architecture, pin description, memory segmentation, addressing modes, instruction set and assembly language programming. Basic Interfacing devices: Memory interfacing, 8255, 8253, 8259, 8257, 8251, Interfacing A/D and D/A converters, Case studies of microprocessor based systems. Salient features of advanced microprocessors: 80286,386,486, Pentium.

Introduction to 8051 microcontrollers, its architecture, pin description, I/O configuration, interrupts, addressing modes, an overview of 8051 instruction set, Microcontroller applications.

Text/ Reference Books:

1. 8085 Microprocessor Ramesh Goenkar, Prentice Hall
2. Microprocessor and Interfacing D. V. Hall
3. The 8051 Microcontroller Kenneth J Aya
4. THE INTEL MICROPROCESSORS BARRY B. BREY, Pearson Prentice Hall

<u>Micro Processor & Micro Controller-Lab</u>

1. Write C program to interface stepper motor.
2. Write C program to interface DC motor.
3. Write C program to interface traffic light controller.
4. Write C program to interface Elevator.
5. Write C program to interface ADC-DAC controller.
6. Write C program to interface temperature controller.
7. Write C program to interface DAC controller.
8. Write a program to add two 8-bit BCD numbers.
9. Write a program to add ‘n’ 8-bit BCD numbers.
10. Write a program to add two ‘n’ byte BCD numbers.
11. Write a program to perform 8-bit binary subtraction.
12. Write a program to perform 8-bit binary subtraction by 1’s compliment method.
13. Write a program to perform 8-bit binary subtraction by 2’s compliment method.
14. Write a program to perform 8-bit binary subtraction by 9’s compliment method.
15. Write a program to perform 8-bit binary subtraction by 10’s compliment method.
16. Write a program to perform two ‘n’ byte binary subtractions.

Course Name: Analog & Digital Communication **Code: EC 223**

Basic blocks in a communication system: transmitter, channel and receiver; baseband and passband signals and their representations; concept of modulation and demodulation. Continuous wave (CW) modulation: AM, DSB/SC, SSB, VSB, methods of generation; Demodulation techniques of CW modulation: coherent and non-coherent; Nonlinear modulation techniques: FM and PM, narrowband FM, wideband FM, methods of generation; FM spectrum; Demodulation techniques for FM; Frequency Division Multiplexing (FDM); Radio transmitters and receivers. Performance of analog modulation schemes in AWGN : CNR, post-demodulation SNR and figure of merit for AM, DSB/SC, SSB, FM, threshold effect in FM, pre-emphasis and de-emphasis in FM, FMFB. Noise in receivers; Noise figures; Radio link design.

Signal analysis and analog modulation: Analog signal, digital, convolution correlation, autocorrelation, of analog modulation, amplitude and angle modulation, spectral analysis and relation, noise source, band pass noise, noise performance of AM and FM signal. Pulse Modulation: Natural sampling, flat top sampling, sampling theorem, PAM, bandwidth, pulse time modulation method of generation and detection of PAM, and PPM, time division multiplexing, Noise in pulse modulation system.

Pulse code modulation: Quantization of signal, quantization errors, PCM, PCM system, comp multiplexing PCM system, differential PCM, delta modulation, adaptive delta modulation, noise in PCM system. Information theory and Coding: Unit of information, entropy, Joint and conditional entropy, information rate mutual nformation, channel capacity of BSC, BEC and binary channel theorem Shannon Harte'y theorem, bandwidth S/N trade off, average length of code control coding, Hamming distance block code, convolution code.

Digital Communication: Differential phase shift keying (DPSK), quadrature phase shift k (QPSK), M- ray PSK, Binary frequency shift keying (BESK), comparison of DPSK QPSK, M-ray FSK, duo binary encoding, base band signal reception, probability of optimum filter, matched filter.

Text/ Reference Books:

1. Modern Digital and Analog Communication Systems — B.P.Lathi,
2. Communication Systems — Simon Haykins
3. Communication Systems — A. B. Carlson
4. Analog & Digital Communication — R.P. Singh & Sapre
5. Communication Engineering — Rao

<u>Analog Communication Lab Experiments</u>

1) Double side band AM Generation.
2) Double side band AM Reception.
3) Single side band AM Generation.
4) Receiver Characteristics (Selectivity, Sensitivity, Fadelity).

5) Frequency Modulation using Reactance Modulator.
6) Frequency Modulation using Varactor Modulator.
7) Quadrature Detector.
8) Operation of Phased locked loop Detector.
9) Operation of Foster – Seeley loop Detector.
10) Operation of Ratio Detector.

Course Name: Database Management Systems **Code: ECE 224**

Introduction to DBMS concepts and architecture: file organization techniques, database approach v/s traditional file accessing approach, advantages of database systems, data models, schemas and instances, database languages and interface, initial conceptual design of database, DBMS Architecture database system utilities, data independence, functions of DBA and designer.

Entities attributes, entity types, value sets, key attributes, relationships, defining the E-R design of database. Relational data models: Domains, tuples, attributes, relations, characteristics of relations, key attributes of relations, relational database, schemas, integrity constraints, update operations on relations. Hierarchical data model: Hierarchical database structures, Integrity constraints, data definition and manipulation in hierarchical model. Network data model: Records, record types and data items, set types and set instances, constraint on set membership, representation of set instances, special types of sets, DBTG proposal and implementation.

Relational algebra and relational calculus: Relational algebra operations like select, project, join, division, outer join, outer union etc., insertion, deletion and modification anomalies. Data definition in SQL, queries, update statements and views in SQL. QUEL and QBE, data and storage definition, data retrival queries and update statements etc.

Introduction to normalization, normal forms, functional dependency, decomposition, dependency preservation and lossless join, problems with null valued and dangling tuples, multivalued dependencies, inclusion and template dependencies. Distributed databases, protection, security and integrity constraints, concurrent operations on databases, recovery, transaction processing, database machines. Comparison of various database models, comparison of some existing DBMS.

Text/ Reference Books:

1. Fundamentals of Database System by Navathe
2. Fundamentals of Database System by Korth
3. Database Management System by Raghu Ramakrishnan

Course Name: Probability Theory and Random Process **Code: EC 225**

Fundamentals of probability theory and random processes, axiomatic probability theory; discrete and continuous random variables; functions of random variables; generating functions and transform methods; inequalities, bounds and large deviation theory; convergence and limit theorems; random processes; spectral representation; Gaussian processes; Poisson and birth-death processes; Markov chains; random walks, Brownian motion, diffusion and Ito processes.

Text/ Reference Books:

- Probability Theory and Random Processes by P. Ramesh Babu, TMH 2017
- Probability and Random Processes by Palaniammal S, PHI 2011

Course Name: Electronics Workshop-II **Code: EC 226**

Practical circuit design issues, cost optimization of circuits, design challenges of electronics products, design of Buck and Boost circuits, design of power supply, design of constant current and constant voltage drivers, design of display circuits

References:

1. Robust Electronics Devices, vol 1, John r Barries, Kluwer Academic Publisher
2. Encyclopedia of electronics components charl platt