SCHEME OF TEACHING AND EXAMINATION
2018-19
(Electronics and Communication Engineering)

FIRST YEAR B.Tech.
(Common for All Branches)

I-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 111	Mathematics - I	3	0	3	0	0	80	-	20
ME 113	Mechanical Engg. - I	3	0	3	0	0	80	-	20
ME 114	Workshop Practice	0	1	0	0	3	0	80	20
CE 115	Engineering Drawing	0	1	0	0	3	0	80	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
GROUP I									
BS 100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engg. - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	1	2	0	2	50	30	20
GROUP II									
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	2	1	2	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill	2	1	2	0	2	50	30	20
	Total	15	6	15	0	16	800		
Total Credits/Hours/Marks		21		31			800		

II-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 121	Mathematics - II	3	0	3	0	0	80	-	20
CE 122	Civil Engineering	1	1	1	0	2	50	30	20
ME 123	Machine Drawing - I	0	1	0	0	3	0	80	20
ME 124	Workshop Technology	2	1	2	0	3	50	30	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
GROUP I									
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	2	1	2	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill	1	1	1	0	2	50	30	20
GROUP II									
BS100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engineering - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	1	2	0	2	50	30	20
	Total	15	7	15	0	18	-	-	-
Total Credits/Hours/Marks		22	1	31			800		

SECOND YEAR B.Tech.

III-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 211 (All branches)	Mathematics-III	3	0	3	0	0	80	0	20
EC 212	Electronic Devices & Circuits	3	1	3	0	2	50	30	20
CS 213 (EC)	Object Oriented Programming with C++	2	1	2	0	2	50	30	20
EE 214 (EC)	Network Analysis	2	0	2	1	0	80	0	20
EC 215	Analog Communication Engineering	3	1	3	0	2	50	30	20
EC 216 (EC, EE)	Digital Electronics	3	1	3	0	2	50	30	20
EC 217	Electronic Measurement & Instrumentation	3	1	3	0	2	50	30	20
	NSS/NCC/NSO[1]	-	-	0	0	2	-	-	-
Total		19	5	19	1	12	-	-	-
Total (Credits/ Hours/ Marks)		**24**		**32**			**700**		

IV-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 221 (EC, EE, ME, MI)	Mathematics-IV	3	0	3	0	0	80	0	20
CS 222 (EC)	Data Structure	3	0	3	0	0	80	0	20
EC 223	Applied Electronic Circuits	3	1	3	0	2	50	30	20
EC 224	Microprocessor Architecture & Applications	3	1	3	0	2	50	30	20
EC 225	Telecommunication Engineering	3	1	3	0	2	50	30	20
EC 226	Electromagnetic Field Theory	2	0	2	1	0	80	0	20
EC 227	Electronic Workshop Practices	0	1	0	0	2	0	100	0
	NSS/NCC/NSO	-	-	0	0	2	-	-	-
	Total	17	4	17	1	10	-	-	-
Total (Credits/ Hours/ Marks)		**21**		**28**			**700**		

THIRDYEAR B.Tech.

V-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 311	Digital Signal Processing	3	1	3	1	2	50	30	20
EC312	Theory & Applications of Integrated Circuits	3	1	3	0	2	50	30	20
EC 313	Communication Theory	3	1	3	0	2	50	30	20
CS 314 (CS,EC)	Computer Architecture	3	0	3	0	0	80	0	20
EE 315 (EC)	Control System Engineering	2	0	2	1	0	80	0	20
EC 316	Microwave Engineering-I	3	1	3	0	2	50	30	20
	Total	17	4	17	2	8	-	-	-
Total (Credits/ Hours/Marks)		21		27			600		

VI-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	**MT**
EC 321	Microwave Engineering-II	3	1	3	0	2	50	30	20
EC 322	Industrial Electronics	3	0	3	0	0	80	0	20
EC 323	Digital Communication Engineering	3	1	3	0	2	50	30	20
EC 324	Antenna & Wave Propagation	3	0	3	0	0	80	0	20
CS 325 (EC)	Operating systems	3	0	3	0	0	80	0	20
EC 326	Pulse & Wave Shaping Circuits	3	1	3	0	2	50	30	20
EC 327	System Design Lab	0	1	0	1	2	0	100	0
	Total	18	4	18	1	8	-	-	-
Total (Credits/Hours/Marks)		22		27			700		

FINAL YEAR B.Tech.

VII-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 411	VLSI Technology	3	1	3	0	2	50	30	20
EC 412	Microwave & Satellite Communication	3	1	3	0	2	50	30	20
EC 413	Wireless & Mobile Communication	3	0	3	0	0	80	0	20
EC 414	Radar & TV Engineering	3	1	3	0	2	50	30	20
EC 415	Medical Electronics	3	0	3	0	0	80	0	20
EC 416	Elective-I	3	0	3	0	0	80	0	20
EC 425	Project[1]	0	-	0	0	4	-	-	-
	Total	18	3	18	0	10	390	90	120
Total (Credits/ Hours/ Marks)		21		28			600		

VIII-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 421	Computer Networks & Internet Technology	3	0	3	0	0	80	0	20
EC 422	Optical Communication	3	1	3	0	2	50	30	20
EC 423	VHDL	3	1	3	0	2	50	30	20
EC 424	Elective - II	3	0	3	0	0	80	0	20
EC 425	Project[1]	0	8	0	0	12	0	100	-
EC 426	Practical Training & Industrial Visit	0	4	0	0	0	0	100	-
EC 427	Seminar	0	2	0	0	4	0	100	-
	Total	12	16	12	0	20	260	360	80
Total (Credits/Hours/Marks)		28		32			700		

EC100 – ELECTRONICS AND INSTUMENTATION

Cr. Hrs.	**3(2 +1)**		
	L	**T**	**P**
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course outcome

In this course students will be able to develop understanding of various electronic devices and circuits commonly used in engineering applications. The subject will also give knowledge about working and hands on practice of different electronic instruments used in engineering applications.

UNIT-I

Passive Components: Construction and characteristics of various types of resistors, capacitors & inductors for electronic circuits, color coding of resistors. Semiconductor Devices: Basic theory of semiconductors, constructions and characteristics of PN diode, Zener diode, photodiode, LED, BJT & JFET.

UNIT-II

Bipolar Junction Transistor: Introduction to BJT biasing circuits, Basic concept of class-A, class-B, class-AB, class-C amplifiers.

Power supply: Rectifier circuits and filters. Concept of voltage regulators, Zener diode voltage regulators, Transistor series regulator.

UNIT-III

Feedback & Oscilloscopes: Concept of positive and negative feedback. Introduction to Oscilloscope. Barkhausen criteria. Working principle of RC- phase shift, Wien bridge, Hartley, Colpitts and Crystal Oscilloscopes.

UNIT-IV

Transducers: Active and Passive transducers. Working principle of Thermocouple, LVDT, Strain Gauge and Techo Generator. Instrumentation: Introduction to data acquisition system. Working principle of Electronic Multimeter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope and Spectrum Analyzer.

LIST OF PRACTICAL EXPERIMENTS

1. Identification and testing of different types of passive and active electronic components: Resistors, Capacitors, Inductors, Diodes, Transistors.
2. Plot the V-I characteristics in forward and reverse bias mode for (a) PN junction diode
   (b) ZENER diode and find the cut- in and breakdown voltage respectively.
3. Plot the V-I characteristics of LED diode in forward bias mode and find the glow voltage.
4. Determine the R.M.S value of output voltage and check the waveform on CRO for:
   (a) Half wave rectifier with and without filter.
   (b) Full wave centre tapped rectifier with and without filter.
   (c) Full wave bridge rectifier with and without filter.
5. Plot the input and output characteristics for two configurations of transistors:
   (a) NPN/PNP transistor in CE configuration.
   (b) NPN/PNP transistor in CB configuration.
6. Determine both theoretically and practically the frequency of oscillation for R-C Phase shift Oscilloscope.
7. Determine the output voltage of an amplifier: (a) with feedback (b) without feedback.
8. Study and perform basic measurement of Digital Multi Meter.
9. Study and perform basic measurement of Cathode Ray Oscilloscope/ Digital Storage Oscilloscope.
10. Study of Spectrum Analyzer and perform basic measurements.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Millman and Halkias. Integrated electronics: Mc Grew Hill
2. W.D Cooper. Electronics Instrumentation and Measurement : PHI
3. M.L.Gupta. Electrical Engineering Materials
4. Melvin. Principles of Electronics
5. John D. Ryder. Electronics Fundamentals

BS 211- MATHEMATICS III

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying this course students are able to understand interpolation techniques using various standard interpolation formulas. Laplace transforms and numerical solutions of differential equations are also part of the curriculum that students will learn.

UNIT-I

Interpolation: Finite differences, various difference operators and their relationships, factorial notation. Interpolation with equal intervals; Newton's forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals.

UNIT-II

Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae.

Numerical Differentiation: Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.

UNIT-III

Numerical Integration: Numerical integration by Trapezoidal, Simpson's rule. Numerical Solutions of Ordinary Differential Equations: Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods

UNIT-IV

Laplace Transform: Laplace transforms of elementary functions; Basic properties of Laplace transform; Initial value theorem, final value theorem and convolution property of Laplace transform; Inverse Laplace transforms. Applications of Laplace transform to solve ordinary differential equations.

Text Books/References

1 H.C. Saxena. Text Book of Finite Differences and Numerical Analysis, S. Chand and Co.

2 M.K. Jain, S.R.K. Iyengar and R.K. Jain. Numerical Methods for Scientific and Engineering computation, New Age International (P) Ltd

3 N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition).

4 S.P. Goyal and A.K. Goyal. Integral Transforms, Jaipur Publishing House, Jaipur

EC 212 - ELECTRONIC DEVICE AND CIRCUITS

Cr. Hrs.	**4 (3+1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

In this subject students learn semiconductor physics, internal structure of PN junction and its operation. They are also able to understand functioning of various solid-state devices, diodes, bi-polar junction transistors, and field-effect transistors. Application based study of diode circuits, basic circuits like dc biasing circuits, small-signal ac circuits will be studied to provide an overview of amplifiers.

UNIT-I

Semiconductor physics: Mobility and conductivity, charge densities in a semiconductor. Fermi dirac distribution, carrier concentration of Fermi level in semiconductor Generation and recombination of charges diffusion and continuity equation Mass action Law, Hall effect. Diode circuits: Diode as a circuit element, load line concept, clipping and clamping circuits, voltage multipliers.

UNIT-II

Diodes and Transistor characteristics: Junction transistor, Transistor current components, The transistor as an Amplifier, Transistor construction, The common base configuration, The common emitter configuration, The CE cut-off Region, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter current gain, The Common-Collector configuration, Analytical Expressions for Transistors Characteristics, Maximum Voltage rating. Transistor Biasing and Thermal Stabilization: The operating point, Bias stability, Self-Bias, or Emitter Bias, Stabilization against variations in ICO, VBE, and β, Bias compensation, Biasing techniques for Linear Integrated Circuits, Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability.

UNIT-III

The 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.

UNIT-IV

Field Effect Transistors : The Junction Field Effect Transistor, The Pinch-off voltage, The JFET Volt-Ampere characteristics, The FET Small-Signal model, The Metal-Oxide-Semiconductor FET (MOSFET), The Low-Frequency Common-Source and Common-Drain Amplifiers, The FET as a Voltage-variable Resistor (VVR).Working and characteristics of Photo Transistor, diode, LDR, UJT, SCR, DIAC and TRIAC.

LIST OF PRACTICAL EXPERIMENTS

S.No.	Name of Practical
1	Design and measure output waveform of following clipper circuits : Positive clipper | Negative clipper | Biased clipper
2	Design of following multiplier circuits: Voltage doublers | Voltage Tripler | Voltage quadruples
3	Design clamper circuit and observe the output waveform on CRO.
4	Design CC amplifier : (A) To measure the voltage gain of amplifier. (B) To plot the frequency response characteristic of amplifier.
5	Design the following biasing circuits and compare their stabilities: Fixed bias | Collector to base bias | Self bias
6	Design CE amplifier and measure their h parameter using: (a) Graphical method (b.) Analytical method
7	Design circuit for Photo Transistor and plot the V-I characteristics of it.
8	To plot the V-I characteristics of JFET in Common source and Common Drain configuration and to determine threshold voltage.
9	Design and develop circuit for SCR and plot their V-I characteristics.
10	To demonstrate JFET as a Voltage Variable Resistor
11	Design circuit for DIAC and plot their V-I characteristics.
12	To plot V-I characteristics of TRAIC.
13	To plot V-I characteristics of MOSFET.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. J Millman & C.C. Halkias. Integrated Electornics; Tata Mc-Graw Hill. Pearson Education.
2. Rebert Boylestad & L. Nashelsky. Electronic Devices and Circuit Theory.
3. Sedra Smith. Micro Electronic Circuits. Oxford Press, India.
4. Floyd. Electronic Devices, Pearson Education.
5. hur. Physics of Semiconductor Devices. Prentice Hall of India.
6. D. Nagchoudhuri. Microelectronics devices, Pearson education.
7. G. Streetman Ben. Solid state devices, PHI/Pearson.

EE 214 (EC) - NETWORK ANALYSIS

Cr. Hrs. 2 (2 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**1**	**0**

Course outcome

This curriculum provides an overview of network theorems with analytical approach for sinusoidal and non sinusoidal waveforms by Fourier series. Students are able to analyze synthesis and response of networks using various network functions.

UNIT-I

Network Theorems: Thevenin's, Norton's, reciprocity, Superposition, Compensation, Miller's Tellegen's and maximum power transfer theorems. Network with dependent sources.

Transient Analysis: Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems.

UNIT-II

Linear Network Response To Non-Sinusoidal Inputs: Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in circuit.

Coupling Elements & Coupled Circuits: Conductively coupled circuits. Inductively coupled circuits-mutual inductance, coefficient of coupling and mutual. Inductance between portions of same circuits and between parallel branches. Transformer equivalent. Inductively and conductively coupled circuits.

UNIT-III

Two Port Networks: Two port; parameters and their interrelations - z- parameters, y-parameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port network. Image parameters Attenuation & phase shift in symmetrical T and networks.

UNIT-IV

Network Functions: Terminals and terminal pair, driving point impedance transfer functions, poles and zeros. Procedure of Finding network functions for general two terminal pair networks. Stability & causality.

Network Synthesis: Hurwitz polynomial, positive real function, RL & RC networks synthesis, Foster First & Second form, Cauer forms.

Text Books/References

1 Kuo, F Franklin. Netwrok analysis and sysnthesis, II Ed, 1999, Jhon Wiley & sons
2 C. Desoer and E.S.E.S. Duh. Basic circuit theory, Mc Graw Hill.
3 M.E Van Valkenburg. Network Analysi, Prentice Hall, India.
4 Schaum's Outling series on circuit analysis.
5 W. Hayt and Kinmmerly. Engineering circuit analysis, Mc Graw Hill, Inc.
6 A. Sudhakar and Mohan S.P. Chyam. Circuits and Networks, Tata Mc Graw Hill. India
7 K. Lata Parag. Practical Digital Logic Design and Testing - PHI.
8 Sandise. Modern Digital Design - MGH.
9 Kohavi. Switching and Auomata Theory

EC 215 ANALOG COMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After studying the course the student will be able to understand about various types of signals and systems and their time domain and frequency domain response. The students will learn design principles of various analog modulation and demodulation techniques. The subject also imparts knowledge about qualitative and quantitative behaviour of analog modulations systems in presence of noise.

UNIT-I

Introduction to signal and system (continuous and discrete): Signal and their types, various operations on signal, property of signal, system and their types, Properties of systems. Linear time invariant systems - continuous time and discrete time, Properties of LTI systems and their block diagrams, Convolution. Role in communication system: Fourier series, Fourier transform, Laplace transform z-transform

UNIT-II

Amplitude Modulation: block diagram of communication system, modulation and their need in communication , amplitude modulation and their types, Analysis of standard AM waves , spectrum & power relation in different types of AM system (AM-DSB,AM-DSB/SC, AM-SSB, AM-VSB). Methods of Generation and reconstruction of different AM signal: Different circuits for amplitude modulation and their comparison. Methods of generating DSBSC, SSB and vestigial side band AM and their characteristics. Envelop and coherent demodulation methods for standard AM, DSB-SC, SSB signals. AM transmitter and receiver circuit

UNIT-III

Angle Modulation: Theory of frequency and phase modulations. Relationship between FM & PM, Spectrum and BW of FM and PM signals. Classification of FM (Narrow band & wide band FM) & their pharos diagrams, Direct and In direct methods of generating narrow band and wide band FM. Discriminators and PLL de-modulators for FM and PM. Pre-emphasis and De-emphasis. Frequency multiplier and mixer, comparison of AM & FM.

Characteristics of receivers: double spotting, sensitivity, selectivity, fidelity, double conversion delayed AGC. Choice of IF & RF FM transmitter and receiver circuit.

UNIT-IV

Noise Effects In Communication System: types of noise, frequency representation of noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits Noise in AM & FM: Calculation of signal-to-noise ratio in SSB-SC, DSBSC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators,

S.No.	Name Of Experiment
1	a) Design and demonstrate the generation of AM signal and demodulation of AM signal. Measure modulation index of AM signal. b) Draw the spectrum of AM signal and measure frequency and power.
2	a) Demonstrate the generation and detection of DSB-SC AM signal. Using balanced modulator and product modulator. b) Draw the spectrum of DSB-SC signal and measure frequency and power.
3	a) Demonstrate the generation of SSB-SC AM signal and demodulation of SSB-SC AM signal using product modulator. b) Draw the spectrum of SSB-SC AM signal and measure frequency and power.
4	Demonstrate the generation and detection of FM signal using varactor modulator and ratio detector.
5	Demonstrate the detection of FM signal using various detection methods.
6	Demonstrate the generation of PPM signal and demodulation of PPM signal using low pass filter.
7	Demonstrate the generation of PWM signal and demodulation of PWM signal using low pass filter.
8	a) Demonstrate the generation of PAM signal and demodulation of PAM signal using low pass filter. b) Demonstrate various types of sampling process.
9	Develop the time division multiplexing and frequency division multiplexing.
10	Study of super-heterodyne radio receiver and measure signal at various test points.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. H.Taub & D.L. Schilling. "Principles of Communication Systems", Tata Mc-Grew Hill.
2. G..Kennedy. "Electronic Communication Systems:, John Wiely & Sons.
3. Principles Of Linear Systems And Signals, 2e (Intl. Version), Lathi 2nd, Oxford
4. Signal & Systems 3e, Chen 3rd, Oxford
5. Fundamentals Of Signals And Systems, Wiley
6. Signals And Systems, P Rao, TMH
7. Signals And Systems: A Simplified Approach, Ganesh Rao, 4e, Pearson

EC216 - DIGITAL ELECTRONICS (EC, EE)

Cr. Hrs. 4(3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After learning the course the students will be able to understand various types of digital logic gates and associated Boolean algebra. They understand the basic design of various combinational logic circuits. This course provides a deep knowledge of sequential circuits using various flip flops, knowledge of state machines.

UNIT-I

Number System & Codes: Radix and Radix conversion, Sign, magnitude and complement notation, Arithmetic shift weighted codes,Excess-3 code, Gray code, ASCII & EBCDIC codes, Fixed and floating point arithmetic, BCD addition and subtraction.

UNIT-II

Boolean Algebra And Digital Logic Gates: features of logic algebra, postulates of Boolean algebra, Theorems of Boolean algebra, Boolean function drive logic gates, Exclusive- OR, NAND, NOR gates, their block diagrams and truth tables, logic diagrams from Boolean expressions and vice –versa, converting logic diagrams to universal logic, positive, negative and mixed logic, logic gate conversion.

Minimizing Techniques: Minterm, Maxterm, Karnaugh Map, K map up to 4 variables, simplification of logic function with K map, conversion of truth table of POS and SOP form, Incomplete specified functions, Variable mapping, and Quinn-Mc Klusky minimization techniques.

UNIT-III

Combinational Systems: Combinational logic circuit design, half and full adder, Subtractor, Binary serial and parallel adders, BCD adder, BCD to 7-segment decoder, multiplexer, De-multiplexer, encoder, octal to binary, BCD to excess-3 encoder, Diode switching matrix, Design of logic circuits by multiplexers, encoder, decoders, and de-multiplexer.

UNIT-IV

Sequential Systems: Latches, flip flops, R-S, D, J-K, Master Slave flip flops, Conversion of flip- flops, Asynchronous (ripple), Synchronous decade counter, Modulus counter, skipping state counter, counter design, Ring counter, Counter applications, Registers, buffer registers, shift register.

S.No.	Name of Practical
1	Design a circuit for gray to excess-3 code conversion and vice-versa.
2	Design a circuit for BCD to excess-3 code conversion and vice-versa.
3	Design the following basic logic gates with the help of NAND and NOR gates on bread board : AND, OR and NOT.
4	Design XOR and XNOR gates with the help of NAND gates.
5	Design the following combinational logic circuits and verify their truth tables: Half Adder and Full Adder.
6	Design the following combinational logic circuits and verify their truth tables: Half Subtractor and Full Subtractor.
7	Design a 4:1 MUX and 1:4 DEMUX using logic gates.
8	Design a circuit to display the BCD numbers on a 7-segment display using BCD to 7-segment decoder.
9	Design the following flip flops using logic gates and verify their truth table: SR, JK, D and T flip flop.
10	Design a 3-bit asynchronous counter using T flip flops and verify its count sequence.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. A.P. Malvino & D.P. Leach. Digital Principles & Applications, Tata Mc-graw Hill, Delhi.
2. Morris Mano. Digital Circuit & Logic Design; Prentice Hll of India. 3
3. Tocci. Digital Systems, Pearson Education.
4. Gree. Digital electronics, Pearson Education.
5. Msno. Digital Desigh, Pearson Education.
6. Bartee. Digital Computer Fundamentals, Tata Mc-Graw Hill.
7. Dharam Singh. Digital electronics and Logic Design.

EC 217 - ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Cr. Hrs.	**4(3+1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After learning the course students are able to understand about various types of transducers, and their working principles. Different type of analyzers and display and recorder devices are made understandable. Under the study of this subject, students learn working principle of transducers and measurement techniques of electronic instruments.

UNIT-I

Theory of error & uncertainty analysis: Accuracy & precision limits of errors, systematic & random errors and modeling of errors, probable error combination of error.

UNIT-II

Electronic instruments for measuring basic parameters: Transistor voltmeter- with transistor balanced bridge TVM. Digital voltmeter ramp type, integrating type, DVM. Measurement of time, phase frequency using digital instruments, Q meter.

UNIT-III

Signal generation & analysis: The sine wave generator, pulse, square and function generators, wave analyzer, harmonic distortion analyzer and spectrum analyzer. Instrumentation amplifier.

Transducers as input elements to instrumentation systems: Classification constructional & operational features, strain gauges, displacement, velocity, force, torque and pressure transducers and photosensitive devices.

UNIT-IV

Display devices and recorders: Classification of display devices and systems. Cathode ray tube, light emitting diodes. Incandescent, electroluminescent and liquid-crystal displays, plasma LCD displays, Recorders. Signal Transmission and telemetry: Modulation and encoding methods, transmission media; time and frequency division multiplexing.

S.No.	Name of Practical
1	Measure values of different components using LCR-Q meter and evaluate the error between theoretical and practical values.
2	Demonstrate measurement and control of temperature using PT 100, thermocouple, thermistor temperature sensor.
3	Demonstrate and plot characteristics of strain gauge using strain gauge transducer.
4	Measure displacement using linear variable differential transducer and plot the characteristic parameters.
5	Demonstrate and verify the load values using load cell and evaluate the percentage error between theoretical and observed values.
6	Demonstrate using an distortion meter the distortion level and audio signal level in a given audio signal.
7	Measure distance using ultrasonic sensor and evaluate the error between theoretical and observed values.
8	Measure the relative humidity using humidity sensor.
9	Determine relative phase shift between two signals using Lissajous pattern.
10	Design a minor project using LM-35 to validate temperature transducer action.
11	Study of spectrum analyzer.
12	To measure the spectral component of a signal using spectrum analyzer.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. H.S. Kalsi. "Electronic Inst. & Measurement, Tata Me. Hill.
2. W.D. Cooper. "Electronic Inst. & Measurement Techniques,Prentice Hall of India.
3. A.K. Sawhney . "Electrical & Electronic Measurement & Inst., Dhanpat Raj & Sons.
4. F.E. Terman & J.M. Pettit. "Electronic Measurements McGraw Hill Book Co.
5. S. Talbar & Upadhyay. Electronic Instrumentation, Dhanpat Rai Sons.

BS 221 - (EC, EE, ME, MI) MATHEMATICS IV

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course enhances the knowledge of students about various probability distribution functions ,Application of fourier series in sinusoidal and non sinusoidal waveforms, and to get a mathematical functionality of partial differential equations and solutions to transcendental and algebraic

UNIT-I

Fourier Series: Fourier series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis.

UNIT-II

Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method; Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow's method.

UNIT-III

Partial Differential Equations: Classifications of partial differential equations; Method of separation of variables to solve Heat equation, Wave equation and Laplace's equations.

UNIT-IV

Statistics: Correlation and regression; Principle of least square method and curve fitting. Probability Distribution Functions: Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions; Binomial, Poisson and Normal distributions.

Text Books/References

1 J.L. Bansal and H.S. Dhami. (2005). Differential Equations (Vols.-II), Jaipur Publishing House, Jaipur.

2 N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics (VII Edition), Laxmi Publication Pvt. Ltd., New Delhi. 3. S.C. Gupta and V.K. Kapoor. Mathematical Statistics, Sultan Chand & Sons, New Delhi.

EC 223 - APPLIED ELECTRONICS CIRCUITS

Cr. Hrs. 4(3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After learning the course students are able to understand about various types' of feedback concepts like positive as well as negative type of feedback and their basic application in amplifiers and oscillators. This course provides deep knowledge of power amplifiers and tuned amplifiers, high frequency amplifiers and their practical applications.

UNIT-I

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

UNIT-II

Oscillators: Basic principle of sinusoidal oscillator (Hartley & Colpitts), Crystal Oscillator.

Waveform Generators: A-stable Multi-vibrator, Mono-stable Multi-vibrator, Bi-stable Multi-vibrator. Schmitt Trigger

UNIT-III

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

UNIT-IV

High Frequency Amplifier: Hybrid-II model of BJT and FET, High frequency analysis of BJT and FET, Cascode Configuration, Tuned amplifiers.

S. No.	**Name of Practical**
1	Design and assemble Mono-stable Multi-vibrator circuit using IC-555 and calculate its duty cycle
2	Design and assemble A-stable Multi-vibrator circuit using IC-555 and calculate its duty cycle.
3	Design and assemble Schmitt trigger circuit using IC-555 and check the waveform on CRO.
4	Design a Voltage Controlled Oscillator using IC-555 and find its control voltage and output frequency.
5	Design and assemble RC phase shift oscillator circuit and measure the frequency of oscillations.
6	To design and assemble Feedback amplifier circuits and find their input and output resistances. (a) Voltage Series feedback circuit (b) Voltage Shunt feedback circuit
7	To design and assemble Feedback amplifier circuits and find their input and output resistances: (a) Current Series feedback circuit (b) Current shunt Feedback circuit
8	To measure voltage gain of Complementary Symmetry Push Pull amplifier circuit.
9	To measure the voltage gain of Class C Power amplifier circuit.
10	To measure the voltage gain of Common Source FET amplifier circuit

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Sedra/Smith. Microelectronic Circuits, Oxford University Press.
2. 2. D. L. Schilling and C. Beloe. Electronic Circuits, McGraw-Hill.
3. 3. S. Soclof. Applications & Design with analog IC's PH1
4. 4. Jacob. Applications & Design with analog IC's, PH1
5. 5. Coughlin Drisocol. Operational Amplifiers & Linear IC's
6. Pearson Education
7. Sedra/Smith. Microelectronic Circuits, Oxford University Press.
8. 2. D. L. Schilling and C. Beloe. Electronic Circuits, McGraw-Hill.

EC 224 - MICROPROCESSOR ARCHITECTURE & APPLICATIONS

Cr. Hrs. 4 (3 +1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After learning the course students are able to understand about architecture of 8085 processor , various blocks and internal diagram of architecture. This course provides deep knowledge of programming and assembly language concepts of 8085 microprocessor.This course provides an overview of peripherals and interfacing of devices with processor 8085 and a hand full knowledge of memory access techniques.

UNIT-I

The 8085 Microprocessor: Block diagram, pins & their description, de-multiplexing of buses, control signals & flags. Introduction to 8085 based microcomputer system. Instruction & Timings: Instruction classification, instruction formats, addressing modes, Instruction timings and status. Interrupts.

UNIT-II

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's and indexing, counters & time delays. Subroutines.

UNIT-III

Interfacing Concepts & Peripherals: Basic interfacing concepts. Memory mapped and peripheral mapped I/O. Description, programming & interfacing 8255, 8279 with 8085. Description of simple systems using above chips. Direct memory Access: Basic concepts FDMA techniques. Description, Programming and interfacing of DMA controller 8257.

UNIT-IV

Description, programming and interfacing of 8253 and 8259A with 8085 microprocessor. A/D and D/A converters, Serial I/O & Bus stands: Interfacing of AD558, AD7522, ADC0801, 0808 with 8085. Basic concepts in serial I/O, Software controlled serial I/O. RS232C and standard parallel port of PC.

S.No.	Name of Practical
1	Develop an assembly language code in 8085 to perform the addition and subtraction of two 8-bit numbers.
2	Develop an assembly language code in 8085 to perform the multiplication and division of two 8-bit numbers.
3	Develop an assembly language code in 8085 to perform the addition of 10 consecutive 8-bit numbers stored in memory starting from address 2000H.
4	Develop an assembly language code in 8085 to find out the largest and the smallest number from an array of data using the concept of subroutine.
5	Develop an assembly language code in 8085 to arrange an array of ten 8-bit numbers in ascending and descending order.
6	Develop an assembly language code in 8085 to generate a delay of 1 second assuming the clock frequency to be 3 MHz.
7	Interface 8253 keyboard display controller with 8085 and verify its operation in six different modes.
8	Interface 8279 Keyboard display controller with 8085 using assembly language coding.
9	Interface A/D converter ADC 0808 with 8085 and develop the assembly language code to convert the analog signal into digital form.
10	Interface D/A converter AD 7523 with 8085 and develop the assembly language code to generate square and saw tooth waveforms and observe them on CRO.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. R. Gaonkar. Microprocessor Architecture, Programming & Applications, Wiely Eastern Ltd.
2. D. V. Hall. Microprocessor & Interfacing
3. P. Mathur. Introduction to Microprocessors.

EC 225 - TELECOMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After learning the course students are able to understand about transmission lines, their parameters and various equations related to transmission lines and Smith chart plotting. This course provides student a deep knowledge of automatic telephony, electronic exchange and recent advancements of telephonic world. This course helps student to learn carrier telephony and power line carrier communication.

UNIT-I

Transmission Lines: Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, reflection on a line, SWR of line with different type of terminations. Distortion less and dissipation less lines. Coaxial cables, Transmission lines at audio and radio frequencies. Losses in transmission line. Characteristics of quarter wave. Half wave and other lengths, Smith chart and its application. Transmission line applications, Impedance matching Networks, Single & double stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

UNIT-II

Attenuators & Filters: Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators. Pi-section. T-section filter, m-derived filter sections. Lattices filter section.

UNIT-III

Carrier Telephony: Multi-channel systems; frequency division & time division multiplexing, power line carrier communication. Telephone Transmission: Telephone Instrument; Rotary dial singing. Echo suppressors & cancellers, cross talk.

UNIT-IV

Basics of Automatic telephony: Trunking concepts. Grade of service. Traffic definitions. Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange. EPABX and SPC Exchange. STD. ISD.
Recent Trends in Telecommunication: Voice frequency telegraphy. Facsimile & telex services.

S.No.	Name of Practical
1	Design an attenuation circuit using T-type and π-type network to attenuate a signal.
2	Demonstrate the Characteristics of low pass filter using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
3	Demonstrate the Characteristics of band pass filter using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
4	Design open and short transmission line using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
5	Design thru transmission line using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
6	Design T-type impedance matched transformer using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
7	Design π-type impedance matched transformer using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
8	Design T-type power attenuator using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
9	Design π-type power attenuator using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
10	Demonstrate the Characteristics of BJT amplifier using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).
11	Determine attenuation and characteristics parameter at different length of transmission line.
12	Measure the input impedance at different length of transmission line.
13	Determine the stationary wave ratio at different length of transmission line.
14	Demonstrate the working of different sections of telephone handset instrument. Measure test point voltages and test point waveforms for different sections.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. W. Fraser. Telecommunications (BPB Publication)
2. Vishvanathan. Telecommunication switching systems & Networks. Prentice Hall of India.
3. Cole. Introduction to Telecommunication. Pearson Education.
4. Floyd. Telecommunication Switching Traffic and Networks, Pearson Education.

EC 226 - ELECTROMAGNETIC FIELD THEORY

Cr. Hrs.	**2 (2+0)**		
	L	**T**	**P**
Credit	**2**	**0**	**0**
Hours	**2**	**1**	**0**

Course outcome

After learning the course, students are able to understand about vector relation in various general curvilinear coordinate systems. This course helps student to learn basic laws of magneto-statics and electrostatics. This course covers a large area of time varying fields and radiations and electromagnetic interference and electromagnetic compatibility.

UNIT-I

Introduction: Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient. Divergence and curl, Green's & Stoke theorems.

Electrostatics: Electric field intensity & flux density. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. field determination by method of Image Boundary conditions.

UNIT-II

Magnetostatics: Magnetic field intensity, flux density & magnetization, Faraday's Law. Bio-Savort's Law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy storage in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field maping and concept of field cells.

UNIT-III

Time Varying Fields: Displacement currents and equation of continuity. Maxwell's equations. Uniform plane wave in free space dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of UPW, standing wave ratio. Poynting vector and power considerations.

UNIT-IV

Radiation: Retarted Potentials and concepts of radiation, Radiation from a small current element, Radiation resistance.

EMI and EMC: Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating Interference shielding, grounding, conducted EMI. EMI testing: emission testing, susceptibility testing.

Text Books/References

1. Griffiths. Introduction to Electrodynamics. (2nd Ed.Prentice Hall of India.
2. V.V. Sarwate. Electromagnetic Fields and Waves, Willey Eastern Ltd.
3. J.D. Kraus. Electromagnetics, Mcgraw Hill.
4. E.C. Jordan and K.G. Balmain. Electromagnetic Waves and Radiating Systems, PHI.
5. W.H. Hayt Jr. Engineering Electromagnetics, Tata Mcgraw Hill.
6. Cheng. Field and Wave Electromagnetic, Pearson Education.
7. David Change, Sadiku. Elements of Electromagnetics, Oxford Press
8. F. Ulabi. Applied Electromagnetics
9. O. P. Gandhi. Schaum's Electromagnetics, MGH
10. Balanis. Applied Electromagnetics

EC -227 ELECTRONIC WORKSHOP & PRACTICES

Cr. Hrs.	**1(0+1)**		
	L	**T**	**P**
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

Course outcome

After learning the course students are able to understand about PCB fabrication works and various types of testing of electronic components. This course provides a deep knowledge of practical approach towards project designing of both major and minor type. The course gives a deep working experience on various measuring devices .

S.No.	Name of Practical
1	Testing and identification of various electronics components using DMM and CRO.
2	Study of technical symbols used for various electronic components.
3	Study of data sheet of various electronic components e.g. Transistors, diodes ,capacitors etc.
4	Testing of various digital and analog integrated circuits using IC tester.
5	Demonstrate and perform operation of soldering and de-soldering on general purpose PCB.
6	Demonstrate and perform operation of drilling on PCB.
7	Design PCB artwork for a given electronic circuit on a simulator e g. Express PCB.
8	Demonstrate PCB fabrication procedure for preparation of PCB on a PCB fabrication machine.
9	Demonstrate various technical faults observed and their rectification on CRO trainer kit.
10	Design a minor project of at least 20 components and demonstrate the working of same.
11.	Design a project using surface mount devices.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

EC 311 DIGITAL SIGNAL PROCESSING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**1**	**2**

Course outcome

After studying this course students gets to know about Discrete Fourier Series and Discrete Fourier Transform.LTI systems and their application IIR & FIR type digital filters: the "derivative approximation" and the "bilinear transformation" techniques. They also learn about the "windowing method" & Multirate signal processing and its applications.

UNIT-I

Sampling: Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.

Transform Analysis of LTI Systems: Time domain representation of Linear Time Invariant (LTI) systems, Properties of LTI systems, The frequency response of LTI systems. Introduction of Z transform, ROC, Properties of z-transform, Inverse z-transform, Applications of z-transform in the analysis of discrete time LTI systems.

UNIT-II

Structures for Discrete-Time Systems: Block diagram and signal flow graph representation of LCCD (LCCD-Linear constant Coefficient Difference) equations, Basic structures for IIR and FIR systems. Transposed forms.

UNIT-III

Filter Design Techniques: Introduction, Design of Discrete-Time IIR filter from Continuous-time filters, filter design by impulse invariance, Bilinear transformation, Design of FIR filters by Windowing-examples of FIR filter design by the kaiser window method.

UNIT-IV

The Discrete Fourier Transform: The discrete Fourier series (DFS) Properties of the DFS, The discrete Fourier transform (DFT), Properties of the DFT, Implementing LTI systems using the DFT, Efficient computation of the DFT, The Goertzel Algorithm, Decimation-in-Time and decimation-in frequency FFT Algorithms, Implementation of the DFI using convolution.

S.No.	NAME OF EXPERIMENT
1	Develop a code for the FSK digital modulation & demodulation technique using simulation tool.
2	Develop a code for generation of sine and cosine wave using simulation tool.
3	Develop a code for multiplication of two matrix using simulation tool.
4	Develop a code for unit impulse, step, ramp function and its folded sequence with delay using simulation tool.
5	Develop a code for any random expression and verify the same using simulation tool.
6	Develop a code for determine the average power of sequence using simulation tool.
7	Develop a code to generate a music notes Sa, Re, Ga , Ma, Pa, Dha , Ni, Sa using simulation tool.
8	Develop a code to find the z-transform of random data using simulation tool.
9	Develop a code to plot the magnitude phase, real part and imaginary part of given signal using simulation tool.
10	Develop a code to check whether a given function is linear or not liner using simulation tool.
11	Develop a code to find the convolution of given function using simulation tool.
12	Develop a code to verify the sampling theorem using simulation tool.
13	Develop a code to verify power spectral density using simulation tool.
14	Develop a code to verify fast Fourier transform using simulation tool.
15	Develop a code to compute and verify the discrete time Fourier transform using simulation tool.

NOTE: The actual number of experiment may be more than the above mentioned list.

Text Books/References

1. Schafer. Buck. Discrete Time signal Processing, Pearson Education Asia.
2. Prokis & Monolakis. Digital Signal Processing: Principles, Algorithms & Application, Prentice hall of India.
3. S.K. Mitra. Digital Signal Processing. Tata Mc-Graw Hill.
4. Rabiner & Gold. Theory & Applications of Digital Signal Processing, Prentice Hall of India.
5. Lathi. Signal Processing & Linear System, Oxford Univ Press.

EC 312 - THEORY & APPLICATIONS OF INTEGRATED CIRCUITS

Cr. Hrs.	**4 (3 + 1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

This course enhances the knowledge of op-amp's basic construction, & design basic op-amp circuits, particularly linear and non-linear circuits, signal generators, and data converters. They are able to design active filters and compare the working of multi vibrators using special application IC 555. Students are able to explain applications of analog multipliers and PLL.

UNIT-I

Operational Amplifiers: Basic differential amplifier analysis, various stages of Op-amp, Op-amp parameters, Analysis of type 741 Op-amplifiers

UNIT-II

Operational Amplifier Applications: Comparators, Limiters, Voltage to frequency & Frequency to voltage converters; Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, saw tooth oscillators. Voltage controlled oscillators. Active Filters: Low pass, high pass, band pass and band reject filters.

UNIT-III

Phase-Locked Loops: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL, Introduction to digital PLL.

UNIT-IV

Liner IC's: Four-quadrant multiplier & its applications, voltage reference, basic blocks of liner IC voltage regulators, Three terminal voltage regulators. Positive and negative voltage regulators, Switching regulator

S.No.	Name of Practical
1	Design and assemble an Inverting and Non-Inverting amplifier using IC 741 and measure its performance on CRO.
2	Design and assemble an Inverting and Non-Inverting Adder circuit using IC 741 and measure its performance on result both practically and theoretically.
3	Design and assemble a Subtractor circuit using IC 741 and measure its performance on result both practically and theoretically.
4	Design an Integrator and Differentiator circuits using IC 741 and measure its performance on CRO.
5	Design and assemble a RC phase shift oscillator using IC-741 and find its operating frequency.
6	Design First Order High pass filter and Low pass filter. Draw its frequency response and find its cut off frequency.
7	Design narrow and wide band pass filter. Draw its frequency response and find its cut off frequency.
8	Design narrow and wide band stop filter. Draw its frequency response and find its cut off frequency.
9	Design and assemble a comparator circuit using IC-741 and measure its performance on CRO.
10	Study and demonstrate the characteristics of PLL LM565.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. R.A. Gayakwad. Op-amplifiers & Linear ICs, Prentice Hall of India.
2. Taubay. Operational Amplifiers.
3. K.R. Botkar. Integrated Circuits. Pearson Education
4. R.A. Gayakwad. Op-amplifiers & Linear ICs, Prentice Hall of India.

EC 313 - COMMUNICATION THEORY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

This course gives broad and clear view to student about sampling techniques of both continuous and discrete time systems. Various types of pulse modulation schemes are also studied . Gaussian probability and Rayleigh probability distribution function. The basic concept behind Fourier series and transform are also studied by students.

UNIT-I

Sampling: sampling and their types (Practical aspects of sampling: Natural and flat top sampling.), Mathematical theory of sampling, Sampling theorem, Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples, Aliasing, Sampling in freq. domain, Sampling of discrete time signals. Pulse Analog Modulation: Generation of PAM, PDM, PWM, and PPM signal and methods of reconstruction of original signals. Bandwidth requirements and comparison. Time division multiplexing (PAM-TDM). Frequency Division Multiplexing.

UNIT-II

Fourier Series Representation Of Signal: Fourier series representation of continuous periodic signal & its properties, Fourier series representation of Discrete periodic signal & its properties, Continuous time filters & Discrete time filters described by Diff. equation.

UNIT-III

Fourier transform: The continuous time Fourier transform for periodic and periodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and periodic signals. Properties of DTFT. The convolution and modulation property.

UNIT-IV

Random Variables & Process: Probability & probability density function, Random variables, average value, and variance of a random variable, Techebycheffs inequality, Gaussian probability density and Rayleigh probability density, mean, variance and probability density of sum of random variables, Correlation between random variables Central limit theorem, Autocorrelation and spectral density, Power spectral density of a sequence of random pulses and digital data.

S.No.	Name Of Experiment
1	Design and simulate the DSB-SC circuit using simulation tool and find its modulation index.
2	Design and simulate the SSB-SC circuit using Simulation tool and find its modulation index.
3	Design and simulate the DSB-FC circuit using Simulation tool and find its modulation index.
4	Design and simulate the SSB-FC circuit using Simulation tool and find its modulation index.
5	Design and simulate the PWM circuit using Simulation tool.
6	Design and simulate the PPM circuit using Simulation tool.
7	Generate a Raleigh distribution function for different alpha using Simulation tool.
8	Generate a Gaussian distribution function for different alpha using Simulation tool.
9	Generate a Poisson distribution function for different alpha using Simulation tool.
10	Plot PSD and auto correlation function for normal distribution using Simulation tool.
11	Plot power spectrum of random noise that has a DC component using Simulation tool.
12	Show the power spectrum of white Gaussian noise different load using Simulation tool.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Principles Of Linear Systems And Signals, 2e (Intl. Version), Lathi 2nd, Oxford
2. Signal & Systems 3e Chen 3rd, Oxford
3. Fundamentals Of Signals And Systems
4. Signals And Systems
5. Signals And Systems: A Simplified Approach, Ganesh Rao, 4e, Pearson
6. Signals And Systems: Continuous And Discrete, Roger E Ziemer, 4e, PHI
7. Signals And Systems
8. Probability Statistics And Random Processes, Veerarajan,
9. Probability, Random Variables And Stochastic Processes, Papoulis, TMH
10. Probability, Random Variables And Random Signal Principles, peebles, TMH
11. Probability And Random Processes With Application To Signal Processing, Stark, TMH
12. Probability And Random Processes For Electrical Engineering, Leongarcia, Pearson
13. Probability & Measure, Billingsley, Pearson

EE 315 (EC) - CONTROL SYSTEM ENGINEERING

Cr. Hrs.	**2(2 + 0)**		
	L	**T**	**P**
Credit	**2**	**0**	**0**
Hours	**2**	**1**	**0**

Course outcome

After studying this course student gets knowledge of open loop and closed loop systems. They get an idea about system stability in both absolute and relative format. This course provides student with lead and lag compensating networks. State variable analysis and their model.

UNIT-I

Introduction: - Concepts of open loop and closed loop systems. Mathematical models for feedback systems. Examples and applications of open loop and closed loop systems. Brief idea of multi-variable control systems.

Representation of physical systems: (Electro-mechanical) by differential equations, Determination of transfer function by block diagram, Reduction technique and signal flow graphs techniques.

UNIT-II

System Performance and stability: - Time domain and frequency domain specifications and their correlations. Time response analysis of first and second order systems. Transient response analysis steady state error and error constants.

UNIT-III

Absolute and relative stability. Routh's stability criterion. Root locus method of analysis. Polar plots Nyquist stability criterion. M and N locii, Nichol's chart. Frequency domain methods, Bode plot, Design specification in frequency domain.

UNIT-IV

State Variable analysis: Concept of state, state variables and state model. State models for linear continuous time systems. Diagonalization transfer functions. Solutions of state equations. Concept of controllability and observability.

Elementary idea of compensating networks: Lag, Lead and lag-Lead networks. Brief idea of proportional, derivative and integral controllers.

Text Books/References

1 Gopal Nagrath. Control System Engg.
2 Ogata. Modern Control System.
3 B.S. Manke. Linear Control System - Khanna Publisher.

EC 316 - MICROWAVE ENGINEERING – I

Cr. Hrs. 4 (3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

This subject enhances the knowledge of students about microwave waveguides and components, various types of klystrons and magnetrons circuits their constructions and operational features. Operational and practical considerations of various travelling wave tubes are also studied.

UNIT-I

Microwave wave guides & Components: Introduction of microwaves and their applications, microwave signal propagation and transit time effect, Rectangular wave guides Basic idea of TE, TM, TEM waves propagation, Scattering matrix representation of network, E and H plane Tees, Magic Tee and Hybrid Rings, Microwave corner, Bends, Twists, Directional couplers, Circulators and Isolators.

UNIT-II

Klystrons: Construction and operation of two cavity & multi-cavity Klystron, Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity Klystron , Construction, working and operation of Reflex Klystron, Applications and practical considerations, Velocity modulation, power output and frequency characteristics of a Reflex Klystron, Electron admittance.

UNIT-III

Travelling Wave Tubes (TWT): Construction, Operation and practical consideration of helix type TWT, Introduction of CW power, pulsed dual mode TWT, Coupled cavity TWT, Application of TWT.

UNIT-IV

Magnetron: Types of Magnetron, operation and practical considerations of travelling wave (cavity) magnetron, Introduction of Coaxial, Voltage Tunable and frequency- Agile Coaxial magnetrons, Cylindrical Magnetron Oscillator.

S.No.	Name of Practical
1	To measure the power distribution of various wave guide Tee i.e. E plane, H plane, Magic Tee and draw E and H patterns.
2	Measurement of various parameters like coupling factor, directivity, insertion loss, isolation, power division etc. for given microwave components like magic tees, circulators etc.
3	To develop experimental setup and Plot V-I characteristics of Gunn diode & Determine threshold voltage.
4	Measurement of resonance characteristics of Micro strip resonator and determination of dielectric constant of the substrate.
5	To measure power division of Micro-strip Wilkinson power divider.
6	To plot the attenuation characteristics of variable attenuator on Gunn diode setup.
7	To verify the relationship between power and repeller voltage (mode curves) in reflex klystron and determine the frequency and tuning range.
8	To design an experimental setup for TWT microwave tube for the measurement of its characteristics.
9	To design a coupled cavity slow wave structure (CC-SWS) for a high power travelling wave tube (TWT) using HFSS code.
10	To design an experimental setup for cavity magnetron characteristics measurements.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. S.Y. Laio. 'Microwave devices and Circuits', Prentice-Hall of India.
2. H.J. Reich. 'Microwave Principles', East-West Press.
3. R.E. Collin. 'Foundations for microwave Engineering', Mc-Graw Hill.
4. Sisodia V.L. Gupta. 'Microwave Engineering', New Age.
5. Kulkarni, ‘Microwave Engineering’ Umesh Publications, New Delhi

EC 321 - MICROWAVE ENGINEERING – II

Cr. Hrs. 4 (3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After studying this course students are able to learn microwave measurements for various parameters and get acquainted with knowledge of microwave semiconductor devices. They gets an introductory knowledge of monolithic microwave integrated circuits and introduction to basics of micro strip filters..

UNIT-I

Microwave Measurement: Detection of microwaves, Microwave power measurement, and Impedance measurement, Measurement of scattering parameters, Frequency measurement, and VSWR measurements.

UNIT-II

Microwave Semiconductor Devices: Operation and Practical applications of PIN diode, Varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.

UNIT-III

Monolithic Microwave Integrated Circuits: Introduction, Materials, MMIC Growth, MOSFET fabrication thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.

UNIT-IV

Microwave Lines and Filters: Introduction to micro strip lines, Parallel strip lines. Coplanar strip lines, Shielded strip lines, Slotted lines. Construction, Introduction to Micro strip filters, Directional coupler (Branch line & parallel coupled), Hybrid rings, Power dividers, Micro strip phase shifter.

S.No.	Name of Practical
1	Development of an experimental setup for measurement of VSWR using double minima methods and cross verification of the experimental result.
2	Development of an experimental setup to measure unknown impedance of rectangular waveguide and verify the results using smith chart.
3	Design an experiment to develop I-V characteristics of microwave Gunn diode and to measure output power and frequency as a function of bias voltage using microwave test bench.
4	Development of an experimental setup to carry out Square wave modulation through PIN diode.
5	Study of network analyzer.
6	Development of test setup for measurement of Scattering parameters of various microwave components.
7	Study of microwave development and software simulation tools like ADS, IE3D, FEKO etc.
8	Designing of MMIC structure (MOSFET/Frequency doubler/mixer) using Advance Designing Software (ADS).
9	Design of micro strip filters (Low Pass/ High Pass / Band Pass) using Advance Designing Software (ADS)/ IE3D Software..
10	Development of Polar Plot and Cartesian plot of Azimuth and Elevation planes on Log/Linear scales for radiation pattern of micro strip Antenna.
11	To measure coupling factor Isolation & Directivity of Hybrid ring rat race coupler.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. S.Y. Laio. 'Microwave devices and Circuits', Prentice-Hall of India.
2. K.C. Gupta. 'Microwaves', New Age International.
3. R.E. Collin. 'Foundations for microwave Engineering', Mc-Graw Hill.
4. T.C. Edwards. 'Foundation for Microstrip circuit Design',John Wiley & Sons.
5. Kulkarni, ‘Microwave Engineering’ Umesh Publications, New Delhi
6. B.Bhat & S.K. Koul. 'Stripline like Transmission Lines for Microwave Integrated Circuits, Wiley Eastern Limited.

EC 322 - INDUSTRIAL ELECTRONICS

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

Upon completion of this course, the student will be able to: get acquainted with the concepts of industrial electronic devices and circuits. They understand the construction and the characteristics of Power Devices, including: power diodes, power transistors, thyristors and their applications. The learn about analysis and the functioning of single-phase and three-phase power converter circuits including rectifiers, choppers, inverter and cycloconverters and understand their applications.

UNIT-I

Semiconductor Power Devices: Characteristic of power diodes, power transistor, IGBTS, TRIAC, DIAC, SUS, SBS & SCS.

SCR: Construction & its characteristics, Methods of turning on & turning off. Rating & rating extension by series/parallel operation. Specification & ratings. String efficiency. Simple firing circuit using UJT. Protection of SCR against over current & voltage surges.

UNIT-II

Controlled Rectifiers: Principle of phase control, single phase half wave circuit with RL, RLE, and effect of fly wheel diode. Full wave controlled rectifier, mid-point converter, bridge converter.

Three phase thyristor converter circuit: three phase full converter & three phase semi- converter.

UNIT-III

Choppers: Principle, control strategies, types of chopper circuits, step-up & step-down choppers, thyristor commutation in chopper circuits, voltage & current commutated choppers, load commutated chopper & multi phase choppers.

Power Supply**:** DC Power Supply: switch mode DC power supply, resonant DC power supply, bidirectional DC power supply. AC Power Supply: switch mode AC power supply, resonant AC power supply, bidirectional AC power supply.

UNIT-IV

Inverters: Principle of operation, single phase bridge inverter & three phase bridge inverter. Current source inverters.

Cycloconverter: Principle of operation, single phase to single phase step-up & step-down cycloconverter, mid-point cycloconverter & bridge type cycloconverter. Three phase half wave cycloconverter, three phase to three phase cycloconverter, load commutated cycloconverter.

Text Books/References

1 P.C. Sen. Power Electronics.
2 Dubey. Power Electronics.
3 Ramamurthy. Power Electronics.
4 G.K. Mittal. Industrial Electronics.
5 Agarwal. Power Electronics Systems. Pearson Education India).

EC 323 - DIGITAL COMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

In this course students understand the building blocks of digital communication system and mathematical background for communication signal analysis with pulse modulation system. . They analyze the performance of line coding digital communication system techniques in terms of error rate and spectral efficiency including Inter Symbol Interference (ISI).

UNIT-I

Pulse Modulation Systems: Quantization of signals, Quantization error, PCM, Companding and multiplexing of PCM signals, Delta and adaptive delta modulation, Bit, word and frame synchronization, Matched filter detection.

UNIT-II

Line Coding: Properties of line codes, PSD of various line codes, Polar signaling, ON-OFF signaling, Bipolar Signaling. Pulse shaping, Nyquist criterion for zero ISI, Scrambling, Pre amplifier and equalizer, EYE diagram, Timing extraction and Timing jitter.

UNIT-III

Digital Modulation Techniques: Various techniques of phase shift, amplitude shift and frequency shift keying, Minimum shift keying, Calculation of error probabilities for PSK, ASK, FSK & MSK techniques.

UNIT-IV

Information Theory & Coding: Amount of Information, Entropy, Information rate, Increase in average information per bit by coding, Shannon's theorem and shannon's bound, Capacity of a Gaussian- Channel, BW-S/N trade off, Orthogonal signal transmission, Coding of Information, Hamming code, Single Parity-Bit code, Linear Block code Cyclic codes.

S.No.	NAME OF EXPERIMENT
1	Demonstrate the different types of sampling techniques (natural, flat top and sample and hold) and to establish relationship between sampling rate and signal frequency.
2	Demonstrate the time division multiplexing of signals and de-multiplexing of signals.
3	Demonstrate the noise generator circuit and matched filter detection and to measure the output parameters.
4	Demonstrate the generation and detection of PCM signal and to measure the output parameters.
5	Demonstrate the generation of Delta modulator and demodulator signal and to measure the output parameters.
6	Demonstrate the generation and detection of ASK, PSK, FSK, signal and to measure the output parameters.
7	Demonstrate the generation and detection of DPSK signal and to measure the output parameters.
8	Demonstrate the generation and detection of QAM signal and to measure the output parameters.
9	To develop a code for the ASK, FSK, PSK digital modulation & demodulation technique using simulation tool.
10	To develop a code for the shannon fano and huffman coding technique to calculate the code efficiency and redundancy using simulation tool.
11	To develop a code for the linear block/Cyclic coding technique for user input data using simulation tool.
12	Study of different section of mobile phone trainer and measure test point voltages and test point waveform and observe different faults.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. H.Taub & D.L. schilling. "Principles of communication System",Tata Mc-Graw Hill.
2. Simon Haykin. "Communication Systems", John Wiley & Sons.
3. B.P. Lathi. "Communication Systems", Tata Mc-Graw Hill.
4. Proakis. "Digital Communication" Tata Mc-Graw Hill
5. Sklar. "Digital Communication" Pearson Education
6. P. Chakarbarti. "Principles of Digital Communication" Danpatrai & Sons.

EC 324 - ANTENNA & WAVE PROPAGATION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course helps students to analyse the fundamentals of antenna theory. They understand different types of antennas and the radiation mechanism. They get acquainted with wave propagation basics and the concept of wave polarization. They are able to calculate the directivity, gain and the far field radiation pattern of some basic antenna elements.

UNIT-I

Antenna Theory : Antenna fundamentals and definitions, Radiation from a current element in free space, Quarter & half wave antenna Reciprocity theorem, Resonant and non-resonant antenna, Antenna effective length and aperture, gain, beam width, directivity, radiation resistance, efficiency, polarization, impedance, and directional characteristics of antenna, antenna temperature. VLF, LF, MF and HF antennas, Effect of ground on antennas, antenna loading.

UNIT-II

Antenna Arrays: Two element array, N-element linear arrays, Broadside, end fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Long wire, V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log- periodic antennas.

UNIT-III

UHF and Microwave Antennas: parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Micro strip antennas. Antenna Measurements: Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements.

UNIT-IV

Radio Wave Propagation: Mechanism of radio wave propagation, Reflection, refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, reflection factors for horizontal and vertical polarizations.

Duct propagation and troposphere scattering, Various ionosphere layers, Characteristics of ionosphere and its effects on wave propagation. Critical frequency, virtual height, skips zone & maximum usable frequency. Multiple hop transmission.

Text Books/References

1. J.D. Kraus. 'Antennas'
2. C.A. Balanis. 'Antenna Theory'
3. K.D. Prasad. 'Antenna and Wave Propagation', SATYA Prakashan, New Delhi
4. E.C. Jordan and K.G. Balmain. 'Electromagnetic waves and Radiating Systems', Prentice hall of India.
5. R.E. Collin. 'Antennas & Radio Wave Propagation', Mc-Graw Hill

CS 325 (EC) - OPERATING SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After Completion of this course students are able to learn structure and procedure of operating systems. Students are able to detect deadlocks and recovery procedure for deadlock. Concept of virtual memory and I/O systems is also studied.

UNIT-I

Operating system Introduction and Structure. Processes. Threads, Interprocess communication. CPU Scheduling: Scheduling Algorithm, Multiprocess and Real time process scheduling, Algorithm Evaluation. Process Synchronizations: Semaphores, Critical Regions and Monitors

UNIT-II

Deadlocks: Handling, Prevention, Avoidance and Detection of Deadlocks, Recovery from Deadlocks. Memory Management: Address spaces, Swapping, Contiguous Allocation, Paging, and Segmentation.

UNIT-III

Virtual Memory: Demand Paging, Page Replacement, Page replacement algorithms. File System Implementation: File System Structure, Allocation Methods, Free space Management, Directory Implementation, Efficiency and Performance, Recovery

UNIT-IV

I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem. Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable Storage Implementation. Protection: Goals, Domains, Access Matrix. Security: Problem, Authentication, Program Threats, System Threats, Threat Monitoring, Encryption.

Text Books/References

1 Silerschatz Abraham and Peter Baer Galvin. Operating System Concepts, 6th Ed , John Wiley & Sons

2 D.M. Dhamdhere. System Programming and Operating System, Tata McGraw-Hill, New Delhi.

EC 326 - PULSE & WAVE SHAPING CIRCUITS

Cr. Hrs. 4(3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After completion of this course the student understands the concept behind switching of semiconductor devices and their applications. Students get to learn about filters with reactive elements and are able to learn about blocking oscillators and various types of time base generators.

UNIT-I

Linear wave Shaping: High frequency and low frequency response of RC and RL circuits to step pulse, ramp and exponential wave form inputs, Attenuators, RL A and RLC circuits, Ringing circuit pulse Transformer (Application equivalent circuit and characteristics)

UNIT-II

Non-Linear wave shaping: Steady state switching characteristics of semiconductor devices, clipping circuits, diode clippers, OPAMP. Clippers, Transistor clippers, clipping at two levels, diode comparators, Application of voltage comparators, clamping operation, Diode Clamping circuit, Clamping circuit theorem.

UNIT-III

Transistor as switch, capacitively and inductively loaded transistor switch. Generation of waveforms: Multi-vibrators – Bi-stable , Mono-stable and A-stable multi-vibrators, A Fixed- Bias and self Bias transistor binaries, commutating capacitors Methods of improving resolution, Symmetrical and non- symmetrical triggering of Binaries

UNIT-IV

Schmitt Trigger Circuit: Voltage time base generator, methods of generating a time base wave from: A transistor constant current sweep generator, Miller and Boot strap time base generators, Linearity improvement of current sweep: Blocking oscillators- An a-stable and mono-stable blocking oscillators, Application of Blocking oscillator.

S.No.	Name of Practical
1	Design high pass filter circuit using R-C components and determine the output of circuit for different types of input waveform e.g pulse, step, and square wave. Determine the effect of RC time constant & width of i/p waveform on output. Plot the output waveform for $RC>>t_{p,}$ $RC<<t_p$, $RC= t_{p.}$
2	Design low pass filter circuit using R-C components and determine the output of circuit for different types of input waveform as pulse, step, and square wave. Determine the effect of RC time constant & width of i/p waveform on output. Plot the output waveform for $RC>>t_{p,+}RC<<t_p$, $RC= t_{p.}$.
3	Design a-stable multi-vibrator using BJT, plot the output waveform for different RC values evaluate the error between practical and theoretical values. Demonstrate elimination of charging and discharging effects on the output waveform using non linear element diode. Demonstrate the a-stable multi-vibrator for alternate blinking of LED.
4	Design mono-stable multi-vibrator using BJT, plot the o/p waveform for different RC values and evaluate the error between practical and theoretical values. Use a high pass filter to trigger the MMV.
5	Design precision clipper circuit using OP-AMP 741 and diode IN 4148 to verify clipping operation for voltages less than 700 mV. Design the same for reference of 300 mV and obtain clipping in both direction.
6	Demonstrate Bipolar Junction Transistor as switch for capacitive load and plot the o/p waveform for different value of capacitor with square wave as input.
7	Demonstrate Bipolar Junction Transistor as switch for inductive load and plot the o/p waveform for different value of inductor with square wave as input. Use a solid state relay to drive a 230 volts load either bulb or motor when transistor is working as switch.
8	Design a project to operate/initiate an electrical load after a delay of 5 minutes.
9	Design a project to develop a time base generator for different sweep base values.
10	Design mono-stable multi-vibrator circuit in which pulse width can be modulated using distinct power supply.

NOTE: The actual number of experiments may be more than the above mentioned list.

Text Books/References

1 K.V. Ramanan. Functional Electronics, Tata Mcgraw Hill

EC 327- SYSTEM DESIGN LAB

Cr. Hrs. 1 (0 +1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**1**	**2**

Course outcome

At the end of the course, student is able to Design any real time analog / digital system with the help of various components like microcontrollers, microprocessors, sensors, operational amplifiers etc. Students write the assembly / high level language code for the programming of microcontroller / microprocessor. They acquire knowledge about various types of analog and digital sensors.

S.No.	Name of Practical
1	Interface ADC 0808 with AT89C51 (8051 family) microcontroller and write the assembly language code to convert analog signal in digital form.
2	Design a temperature based switching system using temperature sensor LM 35, AT89C51 microcontroller and SPDT relay.
3	Design a traffic light system using assembly language coding in AT89C51 (8051 family) microcontroller.
4	Design an infra red based security system using AT89C51 microcontroller that turns on the alarm on the entrance of any person in restricted zone.
5	Design a light based system using LDR or photodiode that senses the light in a particular area and turns on a DC motor when the light level crosses a threshold value. Use operational amplifier uA741 as a comparator.
6	Design a circuit to interface LCD with AT89C51 (8051 family) microcontroller and display any text on it.
7	To develop assembly or C language code for ATmega32 microcontroller to make the robot function as a line follower.
8	To develop assembly or C language code for ATmega32 microcontroller to make the robot function as an obstacle avoider.
9	Design a half wave dipole antenna at a frequency of 300 MHz using PCAAD. Plot the radiation pattern of the antenna, measure its directivity and 3 dB beam width.
10	Design a 5-element Yagi-Uda antenna at a frequency of 300 MHz using PCAAD. Plot the radiation pattern of the antenna, measure its directivity and 3 dB beam width.

The actual number of experiments may be more than the above mentioned list.

Text Books/References

1 M.A. Mazidi and J.G. Mazidi. The 8051 Microcontroller and Embedded Systems, Pearson Education Asia. 2

2 M.A. Mazidi. The AVR Microcontroller and Embedded Systems using assembly and C, Pearson Education. 3

3 Antenna Simulation Software: PCAAD.

EC 411 - VLSI TECHNOLOGY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

At the end of the course, student is able to understand NMOS and CMOS fabrication technology, electrical characteristics of device design, They are also able to make physical design and the layout on simulator.

UNIT-I

Introduction to MOS Technology: Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, n-MOS and CMOS fabrication, IC design process, design abstraction levels, CAD tools

UNIT-II

Basic Electrical Properties of MOS Circuits: Ids versus Vds relationship, Aspects of threshold voltage, Transistor Trans-conductance gm. The nMOS inverter, Pull up to Pull-down ratio for a nMOS Inverter and CMOS Inverter (Bn & Bp MOS transistor circuit Model, Noise Margin).

UNIT-III

CMOS Logic Circuits: The inverter, Combinational Logic, NAND Gate NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation.

UNIT-IV

Basic physical design of simple Gates and Layout issues, Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance. Designing with programmable logic devices ROM, PLA, PAL, and PLD. Features and internal structure of CPLDs, FPGAs.

S.No.	NAME OF EXPERIMENT
1	Design and verify INVERTER, two input NAND, and two input NOR gate circuit using simulation tool.
2	Design and verify two input OR, and two input AND gate circuit using simulation tool.
3	Design and verify two input XOR, and two input XNOR gate circuit using simulation tool.
4	Design and verify Half adder and Full adder circuit using simulation tool.
5	Design and verify four bit Full adder circuit using simulation tool.
6	Design and verify Half Subtractor and Full Subtractor circuit using simulation tool.
7	Design and verify four bit Full Subtractor circuit using simulation tool.
8	Design and verify two bit comparator circuit using simulation tool.
9	Design and verify MUX 4:1 circuit using simulation tool.
10	Design and verify two bit multiplier circuit using simulation tool.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Stephen Brown and Zvonki Vranesic. Fundamentals of Digital Logic circuit VHDL Design, Tata Mc-Graw Hill.
2. Neil H.E. Weste. Kamran Eshraghian-Principles of CMOS VLSI Design.
3. A. Douglas Pucknell. Kamran Eshraghian-Basic VLSI Design.
4. Michael John, Sebastian Smith. Application specific Integrated Circuit.
5. Behzad Razavi. Design of Analog CMOS Integrated Circuits, Mc-Graw Hill.

EC412 - MICROWAVE AND SATELLITE COMMUNICATION

Cr. Hrs.	**4(3+1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

This course enhances knowledge of students about LOS communication and propagation phenomenon involved .Student is able to learn elementary skills of satellite communication and various launch vehicles and link design concepts.

UNIT-I

Propagation Phenomena: Fundamentals of fading multipath channels, Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing. Line of Sight Microwave Communication: Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Tx-Rx.

UNIT-II

Elements of Satellite Comm.: Satellite frequency bands. Frequency reuse, orbital period & velocity, coverage angle and slant Range, Eclipse. Satellite Description: Comm. Sub-system, Telemetry, Command & Ranging
sub-system, Attitude control sub-system and Electrical Power sub system, Study of Indian satellites like INSAT series & IRS series etc.

UNIT-III

Launch vehicles: PSLV & GSLV & Placement of Satellite in orbit. Earth Station: Block diagram, Antenna types, LNA, Up-converter & Down-converter, Monitoring & Control, and VSAT.

UNIT-IV

Satellite link design:- Basic link analysis, Interference analysis, Rain induced attenuation & cross polarization. Introduction to FDMA, TDMA, CDMA with reference to Satellite Systems.

S.No.	Name of Practical
1	Study about satellite communication uplink transmitter, downlink receiver and satellite emulator and advantages of satellite communication.
2	Set up satellite communication link using satellite communication trainer.
3	Measure signal parameter in an analog FM / FDM TV satellite link.
4	Measure the C/N ratio of satellite communication link.
5	Measure the S/N ratio of satellite communication li/nk.
6	Send telecomm and receive telemetry data using satellite trainer kit.
7	Observe the effect of fading and measure the fading margin of received signal.
8	Observe the effect of path loss and calculate the distance between transmitter and receiving antenna.
9	Design microwave optics system using microwave propagation trainer.
10	Observe the angle of reflection and the effect of reflection on intensity of the microwave.
11	Observe the propagation delay of satellite communication link.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Rappaport. Wireless Communication, Pearson Education.
2. William Stallings. Wireless communication & Networks, LPE, Pearson Education, Asia.
3. Tri. T. Ha.. Digital Satellite Communications, Mc-Graw Hill International.
4. Dr.Kamilo Fehr. Digital Wireless Communication, Prentice Hall of India.
5. William C.Y. Le. Mobile Cellular Telecommunications, Mc-Graw Hill International Edition.
6. M. Richharia. Satellite Communication System, Mac Millan.
7. Gigliardi. Satellite Comm. CBS publications.
8. Pratt. and Bostian. Satellite Comm. Wiley Eastern Publications.

EC 413 – WIRELSS AND MOBILE COMMUNICATION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This curriculum develops knowledge of student about design fundamentals involved in cellular systems. Student is able to learn about various network technologies and the propagation models in the cellular technology. Various types of multiple access techniques deployed in cellular technology are also part of curriculum.

UNIT-I

Mobile Radio Systems: Historical background of mobile radio communication, Mobile radio standards around the world. Working and operation of cellular (Hexagonal cell structure) communication, Call origination and Termination, Introduction of 2G, 2.5G, 3G ,4G and 5G Cellular networks and introduction of MIMO networks.

UNIT-II

Cellular System Design Fundamentals: Introduction, Frequency reuse, Hand off strategies, Interference & system capacity, Improving coverage and capacity in cellular system, Call routing in GSM, GSM frequency allocation and frame structure and channel assignments.

UNIT-III

Mobile Radios Propagation: Free space model, Ground- reflection model, Knife- edge diffraction model, Okumura model, In –door propagation models.

Small Scale Fading & Multipath propagation: Impulse responses model of a multipath channel, Doppler shift Multipath measurements, Parameters of mobile multipath channels, Types of small scale fading, Clark's model & Two – ray Rayleigh fading model.

UNIT-IV

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

Data Transmission: Introduction of Wireless technique for data transmission & standards. Bluetooth and wireless LANs.

Text Books/References

1 S. Rappaport Theodore. Wireless Communications: Principles & Practices.

2 C. Y. Lee William. Mobile Cellular Telecomm.

3 Schiller. Mobile Communication. Pearson Education India.

EC 414 - RADAR & TELEVISION ENGINEERING

Cr. Hrs. 4 (3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After studying this course student gets knowledge of TV engineering . both monochrome and color technology transmission and reception systems in the TV plate .Students are able to design mathematical model of radar systems and the navigational aids of the radar systems.

UNIT-I

Radar: Radar Block diagram, frequencies and applications, Radar range equation, Continuous wave (CW) & FM radar; Moving target indicator (MTI): Delay line cancellors, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and mono-pulse radar, Types of display, Radar receivers, Noise figure.

UNIT-II

Navigational aids: Principle of operation of Radar direction finder & range system, LORAN system, DME, TACAN, Aircraft landing systems. TV Engineering Introduction: Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis.

UNIT-III

Transmission: Monochrome & colour T.V. cameras, Image orthicon, plumbicon, Videocon and CCD camera tubes, Picture, colour and sound carriers. Vestigial side band transmission. Encoding picture information. Chrominance modulation. Compatibility of colour and monochrome T.V. systems. Block diagram of T.V. transmitters. TV transmitting antennas.

UNIT-IV

Reception: Types of Monochrome and colour picture tubes, set-up adjustments, Decoding picture information. Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and theri diagnosis T.V. receiving antennas.

S.No.	Name of Practical
1	Investigate the fundamental concept of Doppler Radar, Set up radar and tune it for best performance and measure speed of fan using radar also find out the time period and frequency of a moving pendulum for different length.
2	Measure the speed of moving object using velocity simulator.
3	Understand the working of SMPS section and isolate the fault of DC main supply and identify the fault caused by picture tube by changing the load of the SMPS.
4	Determine the faults in LED TV trainer kit for sound and keypad section.
5	Identify the faults in LCD TV trainer kit for sound, remote and power section.
6	Identify the fault that may be responsible for cracking/faulty audio. By understanding the effect of cutting of power supply of audio amplifier transistor “t601” and understand the role of controlling voltage by volume control signal transistor “t901” in the working of color television on the color TV trainer kit.
7	Understand the division of RF range between three bandwidth of the incoming cable signal for VI, VH & UHF range and also understand the reason behind applying horizontal alignment to the picture tube by coming from the horizontal driver circuit and control by the transistor switch “t404” D1877.
8	Understand the Various Section of Color TV trainer kit. • EHT Section • Vertical & Horizontal Section • Memory Section • Remote Control Section
9	Study the block diagram and working principle of DTH receiver and demonstrate faults and also observe voltage and waveforms.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. M.I.Skolink. 'Introduction to Radar System', Mc-Graw Hill.
2. N.S. Nagaraja. 'Elements of Electronic navigation', Tata Mc-Graw Hill.
3. R.R. Gulati. Monochromic and Colour Television, Wiley Eastem.
4. Dhake. Television Engineering. Tata Mc-Graw Hill.

EC 415 - MEDICAL ELECTRONICS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying this course students are able to learn electrical activity of human body system based on the neural muscular and chemical changes. Various transducers are also elaborated which are useful for biomedical signals. Various monitoring systems for patient care and safety measures are also part of this curriculum.

UNIT-I

Human Body Subsystems: Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.

Transducers and Electrodes: Principles and classification of transducers for Biomedical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes

UNIT-II

Cardiovascular System Measurements: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, plethysmograph, Echocardiograph.

Instrumentation for Clinical Laboratory: Measurement of pH valve of blood, ESR measurement, haemoglobin measurement, O2 and CO2 concentration in blood, GSR measurement.

UNIT-III

Measurement of Electrical Activity in Neuromuscular System and Brain:

Neuron Potential, muscle potential, brain potentials, electroencephalography. Electromyography.

Medical Imaging: Diagnostic X-rays CAT, MRI, theromography ultrasonography, medical use of isotopes, endoscopy.

UNIT-IV

Patient Care, Monitoring and Safety Measures: Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices.

Computer Applications and Biotelemetry: Real time computer application, data acquisition and processing, revote data recording and management. Therapeutic and Prosthetic Devices: Introduction to cardiac pacemakers, defibrillators, muscle stimulators, diathermy, heart lung machine, Haemodialysis, Applications of Laser.

Text Books/References

1. J.G. Webster. Medical Instrumentation, Application and Design, John Wiley and sons.
2. B.Jacobson, J.G. Webster. Medical and clinical Engineering, Prentice Hall of India.
3. Cromwell. Biomedical Instrumentation and Measurement, Prentice Hall of India.
4. R.S. Khandpur. Handbook of Biomedical Instrumentation, Tata Mc-Graw Hill.
5. Carr. Introduction to Biomedical Equipment Technology, Pearson Education

ELECTIVE I

EC 416 (A) – IC TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying these course student is able to understand various steps in the IC fabrication process using different technologies. This course also provides students knowledge about VLSI process integration for different IC technology.

UNIT-I

Introduction to Technologies: Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation-Silicon Shaping, Etching and Polishing, Chemical cleaning.

UNIT-II

Diffusion & Ion Implantation: Ficks diffusion Equation in One Dimension Atomic model, Analytic Solution of Ficks law, correction to simple theory, Diffusion in SiO2 lon Implantation and lon Implantation Systems Oxidation. Growth mechanism and Deal-Grove Model of oxidation, Linear, and Parabolic Rate coefficient, the structure of SiO2 Oxidation techniques and system Oxide properties.

UNIT-III

Chemical Vapour Deposition and Layer Growth: CVD for deposition of dielectric and polysilicon- a simple CVD system, Chemical equilibrium and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor, Epitaxy- Vapour Phase Expitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.

UNIT-IV

Pattern Transfer: Introduction to photo/optical lithography, Contact/proximity printers, Projection printers, Mask generation, photo resists, Wet etching, Plasma etching, and Reaction ion etching.

VLSI Process Integration: Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOSIC Technology, Bipolar IC Technology.

Text Books/References

1 S.M. Sze.VLSI Technology, Tata Mc-Graw Hill.

2 D. Nagchoudhary. Pinciples of Microelectronic Technology, Wheeler Publishing.

3 A Campbell Stephen. The Science and Engineering of Microelectronic Fabrication, Oxford University Press.

4 Hong Xiao. Introduction to Semiconductor Manufacturing, Prentice Hall India.

5 Kang- CMOS circuit design, Tata Mc-Graw Hill.

6 Razoni. Design of CMOS Analog Integrated Circuit

ELECTIVE I

EC 416(B) - ADVANCE DATA STRUCTURE

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course provides students knowledge of tree and heaps which are used in data structure. They also learn algorithms used for graph technology.Students learn about algorithms used for implementation of data structure using tree and mergeable heap systems.

UNIT-I

Advanced Trees: Definitions and operations on weight balanced trees (Human trees), 2-3 trees and Red-Black trees. Augmenting Red-Black trees to dynamic order statistics and interval tree applications. Operations on disjoint sets and its Union-Find problem. Implementing sets, discitionerics, priority queues and concatenable queues using 2-3 trees

UNIT-II

Merge-able Heaps: Merge-able Heap operations, bionomial trees, Implementing binomial heaps and its operations, 2-3-4 trees and 2-3-4 heaps, Structure and potential function of Fobonaccl heap. Omplementing Fibonacci Heap.

UNIT-III

Graph Theory Definitions: Definitions of Isomrpl ismrphism, Components, Corciots, Fimda, emta; Corciots, Cut-sets, Cut-Vertices, Planer and dual graphes, Spanning trees, Kuratovskl's two graphs

UNIT-IV

Graph Theoretic Algorithms: Algorithms for connectedness, finding all spanning tress in a weighted graph and planarity testing. Breadth first and depth first search, topological sort, strongly connected components and, articulation point, Single source shortest path and all pair shortest path algorithms. Min-Cut Max-Flow theorem of network flows, Ford- Fulerson Max Flow algorithms.

Text Books/References

1 Narsingh Deo. Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India
2 Cormen. Introduction to Algorithms, Prentice Hall of India.
3 A.V. Aho, J.E. Hopcrpft and J.D. Ullman. The Design and Analysis of Computer Algorithms, Addition-Wesley.
4 Horwitz and Sawhni. Fundamentals of Data Structures, Galgotia Book source.
5 Wilson. Introduction to Graph Theory, Pearson Education.

ELECTIVE I

EC 416(C) - AUDIO VIDEO SYSTEM

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying this course student gets to know about microphones and speaker systems and various recording devices. Student learns about VCR, CD systems and electronic video cameras and a brief description about TV technology.

UNIT-I

Audio Systems: Important types of microphones and speakers, Monophonic, stereophonic and quadraphonic audio systems.

Disc and Magnetic Recording & Reproduction: Monophonic and stereophonic disc recording and reproducing systems, Magnetic recording & playback Biasing & equalisation, Recording medium, Magnetic heads-replay & erase heads, Audio cassettes, Tape speed, Maximum usable frequency, Tape transport mechanism, Distortion & noise aspects, HI-FI stero system.

UNIT-II

Video Cassette Recorders: Video recording requirements Video tape formats. Modulation-up conversion and down conversion of video signal, Servo systems, Functional Block diagram of VCR, Video doc recording & playback.

UNIT-III

Compact Disc Recording & Reproduction: Compact disc advantages, Specifications, CD player optical requirements, CD technology & manufacturing, CDRO, CD video.

UNIT-IV

Video Cameras: Image conversion principle, Plumb-icon, Silicon camera tubes, Three tube colour camera, Block diagram of colour camera tube.

TV Engineering: Scanning process, Interlaced scanning, Composite video signals, Principle of black & white TV colour TV receivers, Primary colours, Chrominance & luminance signals. Colour TV Systems-NTSC, SECAM, PAL, Transmission & reception using PAL systems.

Text Books/References

1 S.P. Bail & R. Bali. Audio Video systems, Khanna Book Publishing Co. Delhi.

2 Ajay Sharma. Audio and Video Systems, Dhanpat Rai & Co.

3 R.G. Gupta. Audio and Video Systems Tata Mc-Graw Hill.

ELECTIVE I

EC 416(D) - ADVANCE MICROPROCESSOR

Cr. Hrs. 3 (3 +0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course provides students a deep knowledge of 8086 and other advance microprocessor. They learn a brief description of Pentium processor and the communication within processors and architectural behavior model of the microprocessor systems.

UNIT-I

8086/8088 Microprocessor: Hardware specifications, architecture, address spaces, clock generator, bus controller and arbiter, Minimum and maximum mode. System Bus Timing. Assembly language programming, addressing mode and instructions of 8086/8088, linking and execution of programs. MACRO programming, assembler directives and operators

UNIT-II

I/O Interfaces: Serial Communication interface 8251, LCD interfacing, A/D Converter 0808, D/A converter AD7528, DMA controller 8257, 8255 PPI.

UNIT-III

Multiprocessor Configurations: 8086/8088 base Multiprocessor systems, 8087 Numeric data processor. 8089 I/O processors. 80386, 80486 Microprocessors: Introduction and Architecture.

UNIT-IV

Recent Advances in Microprocessor Architecture: Pentium II and III architecture, pipelining, SIMD features, branch handling on-chip cache and buffers, MMX technology.

Text Books/References

1 Dougtas V.Hall. Microprocessors & Interfacing: Programming and Hardware, Tata Mc-Graw Hill.

2 Yu-Cheng Liu, Glenn A.Gibson. Microprocessor systems: The 8086/8088", Prentice Hall of India.

3 A.K. Ray, K.H. Bhurchand. Advanced Microprocessor and Peripherals, Tata Mc-Graw Hill.

4 Barry B. Brey. The Intel Microprocessors: Architecture, Programming & Interfacing, Pearson Education Asia. 5, J.L. Antonalces .The pentium Microprocessors, Pearson.

ELECTIVE I

EC 416 (E) - AI & EXPERT SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course provides students with knowledge of artificial intelligence programming languages and implementation of same. Programming simulations based on organization and manipulations of knowledge system architecture are also part of the syllabus.

UNIT-I

Introduction to AI Knowledge: Importance of AI. Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages.

UNIT-II

Knowledge Representation: Syntax Semantics, Inference Rules, Non deductive Inference methods, and representation using rules, forward chaining and backward chaining. Fuzzy Logic & Natural languages computations, Probabilistic Reasoning, Object Oriented Representations.

UNIT-III

Knowledge Organization & Manipulation: Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.

UNIT-IV

Knowledge Systems Architecture: Rule based, non-production, uncertainty knowledge system building tools.
Knowledge Acquisition: General concepts, learning by induction.

Text Books/References

1 AI & ES. Dan W.Patterson
2 Luger. Artificial Intelligence
3 Jockson. Introduction Expert Systems Knigh- Artifical Intelligence, Tata Mc-Graw Hill

EC 421 - COMPUTER NETWORKS & INTERNET TECHNOLOGY

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course gives deep knowledge of terminology and concepts of the OSI reference model and the TCP-IP reference model to master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks. They identify different types of network topologies and protocols. Students learn about the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

UNIT-I

Introduction: Network structure, network architectures. The OSI reference model, services, standardization, example networks.

The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449. Pulse code modulation. FDM & TDM. Circuit switching. Packet switching. Hybrid switching. Polling. CCITT X.21. Ethernet.

UNIT-II

The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols. IEEE standard 802 for LAN. The Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms.

UNIT-III

The Transport Layer: Design Issues. Connection management. Study of Internet and ATM transport layer protocols.

The Upper OSI Layers: The session, presentation and application layers design Issues. Introduction to Cryptography-Private and Public Key Cryptography. Protocol. Introduction to Data Compression.

UNIT-IV

Internet Issues: Principles of bridges and routers. The TCP/IP Protocol suite: Overview of TCP/IP. Addressing, Subnetting and network layer protocols. Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.

Text Books/References

1 Ralf Steinmetz & Klara Nahrstedt. Multimedia computing Communication & Application, Pearson Education Asia.

2 K. Andleigh Prabhat. Multimedia System Design, Prentice Hall, Kiran Thau.

EC 422 - OPTICAL COMMUNICATION

Cr. Hrs. 4(3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

After going thru this course student gets an understanding of optical communication, various constituents of optical communication their application and propagation of electrical signals in fiber and analysis of optical signal. Students are able to design link and able to analyse budgeting procedure of optical systems.

UNIT-I

Optical Fibers: Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Mono mode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Signal Degradation in Optical Fibers: Attenuation, signal distortion in optical fibers, dispersion-intra modal & inter modal, Dispersion shifted and flattened fiber.

UNIT-II

Optical Sources: LED's- Structure, Materials, Characteristics, Modulation, Power and efficiency, Laser Diodes-Basic concepts, Structure, properties and modulation

UNIT-III

Optical Detectors: PIN and avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.

UNIT-IV

Optical Fiber Communication Systems: Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Application, Wavelength division multiplexing. Optical Fiber Measurements: Measurements of Fiber attenuation. Dispersion, refractive index profile, Numerical aperture & diameter.

S.No.	Name of Practical
1	To set up analog and digital link using fiber optical trainer kit.
2	Plot V-I and P-I characteristics of LASER source at 1550 nm.
3	Plot V-I and P-I characteristics of LED source at 850 nm.
4	Measurement of Numerical Aperture of a given optical cable using fiber optical trainer kit..
5	Measurement of Bending loss of a given fiber cable w.r.t. radius of the bend using fiber optical trainer kit.
6	Establish analog and digital signal transmission using 1550 nm LASER source.
7	Measurement of propagation loss of a given fiber cable using fiber optical trainer kit.
8	Demonstrate the generation of FM signal and transmit using fiber optic trainer kit.
9	Demonstrate the working of WDM using optical fiber trainer.
10	To develop and observe the eye pattern on DSO using eye pattern module and measure the BER.
11	To obtain intensity modulation of an analog signal, transmit it over a fiber optic cable and demodulate the same at the receiver to recover the original signal.
12	To obtain intensity modulation of an digital signal, transmit it over a fiber optic cable and demodulate the same at the receiver to recover the original signal.
13	Demonstrate the working of PWM using optical fiber trainer.
14	To study working of optical spectrum analyzer.
15	Measurement of performance parameters of OFC using OSA.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Floyd F. Sabins. Remote Sensing Principles and Interpretation.
2. M. Thomas Lillesand & W. Ralph. Remote Sensing and Image Interpretation
3. C.P. Lo, Albert K.W. Yeung. Concepts and Techniques of Geographic Information Systems. PIII (EEE).
4. Joseph C. Palais. Fiber Optic Communications, LPE, Pearson Education Asia.
5. J.Wilson & Hawkes. Opto Electronics-An Introduction, Prentice Hall of India.

EC 423 - VHDL

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

This course provides deep knowledge of coding in HDL module for combinational and sequential digital circuits and also HDL codes basic for designing of digital systems.

UNIT-I

Combinational Circuit Building Blocks: Combinational logic design for Multiplexer, Decoders, encoders, Code Converters, Introduction to logic minimization techniques, VHDL Code for Combinational Circuits

UNIT-II

A synchronous sequential logic- analysis procedure, state minimization, state assignment. VHDL code for Flip-Flops. shift registers, Counters.

UNIT-III

Synchronous/Asynchronous Sequential Circuits: Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine.

UNIT-IV

Digital System Design: Building Block circuits, Memory organization, SRAM, Design examples of divider, Multiplier, Shifting & Sorting Operations, Clock Synchronization. CPU organization and design concepts.

S.No.	NAME OF EXPERIMENT
1	To develop VHDL code for Full Adder using Half Adder using simulation tool and verify the same on FPGA board.
2	To develop the VHDL code for 16-to-1 Multiplexer using 4-to-1 Multiplexer using simulation tool and verify the same on FPGA board.
3	To develop the VHDL code for BCD to 7-Segment display using simulation tool and verify the same on FPGA board.
4	To develop the VHDL code for Encoders and Decoders using simulation tool and verify the same on FPGA board.
5	To develop the VHDL code for 4-to-2 priority Encoder using simulation tool and verify the same on FPGA board.
6	To develop the VHDL code for Code Converters using simulation tool and verify the same on FPGA board.
7	To develop the VHDL code for Flip-Flops using simulation tool and verify the same on FPGA board.
8	To develop the VHDL code for Shift Registers using simulation tool and verify the same on FPGA board.
9	To develop the VHDL code for Moore Machine using simulation tool and verify the same on FPGA board.
10	To develop the VHDL code for Mealy Machine using simulation tool and verify the same on FPGA board.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. Stephen Brown and Zvonki Vranesic. Fundamentals of Digital Logic circuit VHDL Design, Tata Mc-Graw Hill.
2. Z.Navabi. Analysis and Modeling of Digital Systems, Tata Mc-Graw Hill.
3. D.L.Perry. VHDL 3rd cd., Tata Mc-Graw Hill.
4. Morris Mano. Digital Logic & Computer Design, Prentice Hall of India.

ELECTIVE - II

EC 424 (A) - MICROCONTROLLER & EMBEDDED SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course provides an in depth overview to students about various microcontrollers as 8051, PIC and ARM. Assembly language programming of these microcontrollers and various practical applications in real time procedural to students.

UNIT-I

THE 8051 Microcontroller: Introduction, The 8051 microcontroller hardware. I/O pins, Port, External memory. Counters and Timers, Serial data. Interrupts.

UNIT-II

8051 Assembly Language Programming: Addressing modes, External data moves, push and pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts & returns.

UNIT-III

The AVR microcontroller: History and features, architecture, AVR programming in C, AVR Hardware Connection, and HEX file and flash loaders for ATMEGA32.

UNIT-IV

The PIC microcontrollers: History and features, Microcontrollers and Embedded Processors, Overview of the PIC18 family, PIC architecture, PIC programming in C.

Text Books/References

1. K.N. Ayala. The 8051 Microcontroller. Penram International.
2. M.A. Mazidi and J.G. Mazidi. The 8051 Microcontroller and Embedded Systems, Pearson Education Asia.
3. M.A. Mazidi. The AVR Microcontroller and Embedded Systems using assembly and C, Pearson Education.
4. M.A. Mazidi. PIC Microcontroller and Embedded Systems using assembly and C for PIC 18, Pearson Education.

ELECTIVE - II

EC 424 (B) - IMAGE PROCESSING & PATTERN RECOGNITION

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course enhances the knowledge of image processing in digital domain with restoration and compression of various images,. Perception of image in electromagnetic spectrum.

UNIT-I

Introduction: Imaging in ultraviolet and visible band Fundamental steps in image processing. Components in image processing.

Digital Image Fundamentals: Image perception in eye light and electromagnetic spectrum, Image sensing and acquisition using sensor array. Image sampling and quantization-Representing digital images, Spatial and gray-level resolution, Aliasing and Moirc patterns, Zooming and Shrinking digital images. Relationship between pixels. Camera Model.

UNIT-II

Image Enhancement in Spatial Domain: Gray-level transformation- image negatives, log transformation, power-low transformation, Histogram equalization and matching, Smoothing spatial and sharpening filters.

UNIT-III

Image Restoration: Image restoration model. Noise Models- Spatial and frequency properties of noise, probability density functions. Noise-only spatial filter-Mean filter, order-statistics filter and adaptive filters. Frequency domain filters-Band reject filters, Band pass filters and Notch filters.

UNIT-IV

Image Compression: Compression Fundamental-Coding Redundancy, Inter pixel redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression models-Source encoder and decoder, Channel encoder and decoder, Lossy compression standards.

Text Books/References

1 C. Gonzalez Rafael. Digital Image Processing, Pearson Education Asia.
2 R. Castleman Kenneth. Digital Image Processing, Pearson Education Asia.
3 Nick Effard. Digital Image Processing, Pearson Education Asia.
4 A.K. Jain. Digital Image Processing, Prentice hall of India.
5 Sonka, Hlavac & Boyle. Image Processing. Analysis and machine Vision, Thomas Learning.

ELECTIVE - II

EC 424 (C) - REMOTE SENSING

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying this course student is well acquainted in microwave remote sensing systems using various scanning schemes and visual image interpretation of images obtained from radars and satellites.

UNIT-I

Concepts and Fundamentals of Remote Sensing: Introduction, Energy sources and radiation principles, electromagnetic energy, Electromagnetic spectrum, Energy interactions in the atmosphere, Energy interactions with earth surface features, Remote sensing systems, Spectral reflectance curves, Data acquisition and interpretation, Image characteristics, Multispectral scanning system, Thermal scanning, Hyper-spectral scanning systems, reference data, Radar technologies and terrain interactions. Global positioning system. Introduction of microwave sensing.

UNIT-II

Earth Resource and Environmental Satellites: Introduction to various sensing platforms, SPOT satellite, Landsat satellite, JERS satellite, Indian remote Sensing Satellites, Geostationary Environmental satellite, Polar orbiting NOAA Environmental satellite, Future satellite systems, Various satellite Radar systems like JERS-1, ERS-1, SIR-A mission, Radarsat, Almaz-1, Seasat.

UNIT-III

Introduction to Visual Image Interpretation: Introduction and fundamentals of visual image interpretation. Introduction to Digital Image processing, Image rectification and restoration, Image enhancement Contrast manipulation, Spatial feature manipulation, Multi image manipulation, image classification Supervised and unsupervised classification data merging and GIS integration, Scal effects.

UNIT-IV

Introduction to Geographical Information System: Introduction various GIS operation of GIS to water resource, environmental impact assessment and urban & regional planning.

Text Books/References

1 Floyd F. Sabins. Remote Sensing Principles and Interpretation.

2 M. Thomas Lillesand & W. Ralph. Remote Sensing and Image Interpretation.

3 C.P. Lo, Albert K.W. Yeung. Concepts and Techniques of Geographic Information Systems. PIII (EEE).

4 Jensen. Remote Sensing of Environment, Pearson Education Asia.

ELECTIVE - II

EC 424 (D) NEURAL NETWORKS

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

This course enhances the knowledge of development environment and hardware implementation in neural networks. The analysis of neural networks various models and their system software implementation is also taught to the students.

UNIT-I

Introduction: Biological basis for NN, background and brief history, classification of NN models & implementations
Back Propagation Model: - topology, Calculations, training.

UNIT-II

Self-organization Model: Topology, network initialization, training calculations, testing.
Systems considerations: - Various problems, developing a system specifications, various roles of neural networks, NN software, implementation issues.

UNIT-III

Development Environment and Hardware Implementations: NN modeling languages, specifying NN models, the transporter, using transducers.

UNIT-IV

Performance Metrics & Network Analysis: Percentage correct, average sum-square error, normalized error, network analysis, divide-by three problem, square-within -a square problem, analyzing weights in Trained Networks.
Case Studies: Issues in Radar Signal Processing, optical Character Recognition.

Text Books/References

1 Freeman / Skapura. Neural Networks (Pearson Education India)

ELECTIVE - II

EC 424 (E) - MULTIMEDIA SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome

After studying this course students get knowledge of multimedia and computer image processing in music and graphics. They get familiar with overview of computer based animation and various multimedia operating systems.

UNIT-I

Media and Data Streams: Medium, Properties of Multimedia, Data stream characteristics of continuous media information units.

Music and Graphics: Audio formats, MIDI, Speech Image format, Graphics format, disthering, computer Image Processing.

UNIT-II

Video and Animation: Basic concepts, computer-based Animation, JPEG, MPEG, H.261, DVI, Hybrid coding, CD-ROM Technology. Compact disk digital audio.

UNIT-III

Multimedia Operating Systems: Real time, Process management Rate monotonic algorithm, Earliest deadline first algorithm and Multimedia file systems.

UNIT-IV

Documents: Hypertext, Hypermedia, MHEG.

Synchronization: Intra and Inter object synchronization. Live and Synthetic synchronization, Lip synchronization requirements, pointer synchronization requirements, Elementary media synchronization.

Text Books/References

1 Ralf Steinmetz & Klara Nahrstedt. Multimedia computing Communication & Application, Pearson Education Asia.

2 K. Andleigh Prabhat. Multimedia System Design, Prentice Hall, Kiran Thau.

EC 212 (EE) ELECTRONICS – I

Cr. Hrs. 4 (3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**1**	**2**

Course outcome

In this subject students learn semiconductor physics, internal structure of PN junction and its operation. They are able to understand functioning of various solid-state devices, diodes, bi-polar junction transistors, and field-effect transistors. Application based study of diode circuits, basic circuits like dc biasing circuits, small-signal ac circuits to provide an overview of amplifiers and h-parameters are also studied in this course.

UNIT-I

Semiconductors: Intrinsic and extrinsic semiconductors, Mobility and conductivity, types of doping and its effect on properties of semiconductor, Diffusion, Mass-action Law, Graded semiconductors. Theory of PN Junction Diodes: The open circuited junction, space charge region. The biased p-n junction, the volt-ampere characteristics and volt-ampere equation and effect of temperature on V-I characteristic, junction diode switching times, diode capacitance.

UNIT-II

Diode circuits: Half wave and full wave single-phase rectifiers and their analysis, peak inverse voltage, various types of filters their analysis and applications. Voltage multipliers, Clipping and clamping circuit. Other Types of Diodes: Zener and avalanche breakdown phenomenon in zener diodes, photo-diodes, light emitting diodes, solar cells, and varactor diodes. Bipolar Junction Transistors: The ideal current controlled source, The junction transistor, Ebermoll representation of the BJT, The common base (CB) and common emitter (CE) configuration and their input and output characteristics, current gains alpha & beta, common collector, the forward active, reverse active, cut off and saturation, Modes of BJT.

UNIT-III

BJT biasing and d.c. models, stabilization techniques. BJT as a switch and as an amplifier, The BJT small signal models, h-parameter and hybrid pi model, BJT as a diode, Transistor ratings. Field effect Transistors: Ideal voltage controlled current source, junction field effect transistor and its VI characteristics and its construction. The JFET transfer characteristics. MOSFET: Enhancement and depletion type. Brief idea about construction of MOSFETs, V-I characteristic.

UNIT-IV

Small signal Amplifiers at Low Frequency: Analysis of BJT and FET in various modes; input and output resistance, voltage and current gain, Miller theorem and its dual. Cascaded BJT amplifiers, Differential amplifiers and its analysis, composite transistor stages: Darlington pair and others, Boot strapping.

S.No.	Name of Practical
1	Design and measure output waveform of following clipper circuits : Positive clipper | Negative clipper | Biased clipper
2	Design of following multiplier circuits: Voltage doublers | Voltage Tripler | Voltage quadruples
3	Design clamper circuit and observe the output waveform on CRO.
4	Design CC amplifier : (A) To measure the voltage gain of amplifier. (B) To plot the frequency response characteristic of amplifier.
5	Design the following biasing circuits and compare their stabilities: Fixed bias | Collector to base bias | Self bias
6	Design CE amplifier and measure their h parameter using: (a) Graphical method (b.) Analytical method
7	Design circuit for Photo Transistor and plot the V-I characteristics of it.
8	To plot the V-I characteristics of JFET in Common source and Common Drain configuration and to determine threshold voltage.
9	Design and develop circuit for SCR and plot their V-I characteristics.
10	To demonstrate JFET as a Voltage Variable Resistor
11	Design circuit for DIAC and plot their V-I characteristics.
12	To plot V-I characteristics of TRAIC.
13	To plot V-I characteristics of MOSFET.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. J. Millman & C.C. Halkias. Integrated Electronics: analog & Digital ciruits system, TMH
2. Jacob Millman and Arvin Grabel. Microelectronics, McGraw Hill
3. obert L.Boyle sted & Louis Nashelshky. Devices and Circuit Theory, PHI

EC 219 (CS/IT) - ANALOG ELECTRONICS

	Cr. Hrs.	3 (2+1)	
	L	**T**	**P**
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course outcome

After learning the course students are able to understand about various types feedback concepts like positive as well as negative feedback and their basic application in amplifiers and oscillators. This course provides deep knowledge of power amplifiers and tuned amplifiers. Students analyse high frequency amplifiers and their practical applications.

UNIT-I

Response of Transistor Amplifier: Review of biasing, classification of amplifiers, distortion in amplifiers, frequency & phase response of an amplifier, cascaded amplifiers responses, transistors model at high frequencies for CE and Emitter follower configuration, high frequency response of two cascaded CE transistor stages.

UNIT-II

Feedback Amplifier: Classification of amplifier, feedback concept, general characteristics of negative feedback amplifiers, analysis of a feedback amplifier, various types of feedback and their effects on amplifier performance.

UNIT-III

Power Amplifiers: Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers Efficiency of amplifiers, Push-pull amplifiers (Class A & Class B).

Tuned Amplifiers: Single tuned capacitively coupled amplifier & its steady state response determination of Gain, Band width product. Tapped tuned, inductivity coupled single tuned.

UNIT-IV

Oscillator: Criteria of oscillations, sinusoidal oscillators, Hartley, Colpits, Wein bridge, Phase shift. General form of oscillators, crystal oscillator, Frequency stability.

Operational Amplifiers: Basic op-amp, differential amplifier, IC Op-amp & its characteristics, Linear applications of IC Op-amp, Inventor, Adder, Integrator, Differentiator, Analog computation.

S.No.	Name of Practical
1	Design the following biasing circuits and compare their stabilities: a. Fixed bias b. Collector to base bias c. Self bias
2	Design CC amplifier: a. To measure the voltage gain of amplifier. b. To plot the frequency response characteristic of amplifier.
3	Design CE amplifier: a. To measure the voltage gain of amplifier. b. To plot the frequency response characteristic of amplifier.
4	Design CC amplifier: a. To measure the voltage gain of amplifier. b. To plot the frequency response characteristic of amplifier.
5	To design and assemble Feedback amplifier circuits and find their input and output resistances. a. Voltage Series feedback circuit b. Voltage Shunt feedback circuit
6	To design and assemble Feedback amplifier circuits and find their input and output resistances: a. Current Series feedback circuit b. Current shunt Feedback circuit
7	To measure voltage gain of Complementary Symmetry Push Pull amplifier circuit.
8	To measure the voltage gain of Class C Power amplifier circuit.
9	Design and assemble an Inverting and Non-Inverting amplifier using IC 741 and measure its performance on CRO.
10	Design and assemble an Inverting and Non-Inverting Adder circuit using IC 741 and measure its performance on result both practically and theoretically.
11	Design and assemble a Subtractor circuit using IC 741 and measure its performance on result both practically and theoretically.
12	Design an Integrator and Differentiator circuits using IC 741 and measure its performance on CRO.
13	Design and assemble RC phase shift oscillator circuit and measure the frequency of oscillations.

NOTE: The actual number of experiments may be more than the above mentioned list.

Text Books/References

1. J Millman & C.C. Halkias. Integrated Electornics; Tata Mc-Graw Hill. Pearson Education.
2. Alley & Ahwood, Engineering Electronics., John Wiley & Sons Inc, Newyork London.

EC 225 (EE) - ELECTRONICS – II

Cr. Hrs. 4 (3+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome

In this subject students learn semiconductor physics, internal structure of PN junction and its operation. They are able to understand functioning of various solid-state devices, diodes, bi-polar junction transistors, and field-effect transistors. They learn application based study of diode circuits, basic circuits like dc biasing circuits, small-signal ac circuits to provide an overview of amplifiers and h-parameters.

UNIT-I

High Frequency Amplifiers: Hybrid pi model of common emitter transistor, Hybrid pi conductance and capacitances, Variation of hybrid pi parameters, CE short circuit current gain, and current gain with resistance load. Single stage CE transistor amplifier-response, gain bandwidth product, Emitter follower at high frequencies.

UNIT-II

Feedback Amplifiers: Classification, Feedback concept, transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage series, voltage shunt, current series and current shunt feedback amplifiers, Stability criterion. Oscillators: Classification, Criterion for oscillation, RC-phase shift, Hartley-Colpitts, tuned collector, wein bridge and crystal oscillators; Astable, monostable and bistable multibrators, Schmitt trigger.

UNIT-III

Linear Integrated circuits: Operational amplifier-inverting and noninverting modes, Characteristics of ideal op-amp. Offset voltage and currents, Basic op-amp applications. Differential DC amplifiers, stable ac coupled amplifiers. Integrator and differentiator. Analog computation, comparators, sample and hold circuits, logarithmic and antilog amplifiers. Analog multipliers, precision AC/DC converters-precision limiting, fast half wave and full wave rectifiers. Active average and peak detectors. IC 555 timer and its applications.

UNIT-IV

Active fitters-low pass, high pass, band pass, notch, Butterworth, Basic principle of PLL, block diagram, transfer characteristic of PLL. Power Amplifiers: Class-A large signal amplifiers, second harmonic distortion, higher order harmonic generation, Transformer coupled audio power amplifier, and collector efficiency. Push Pull Amplifiers: Class A, Class B and Class AB operations. Comparison of performance with single ended amplifiers, Regulated power supplies, series and shunt voltage regulators, Brief idea of Monolithic regulator.

S.No.	Name of Practical
1	Design and assemble Monostable Multivibrator circuit using IC-555 and calculate its duty cycle.
2	Design and assemble Voltage Controlled Oscillator circuit using IC-555 and calculate its duty cycle.
3	Design and assemble Astable Multivibrator circuit using IC-555 and calculate its duty cycle.
4	Design and assemble Schmitt trigger circuit using IC-741 and check its performance on CRO.
5	Design an Inverting and Non-Inverting amplifier circuit using IC-741 and check its performance on CRO.
6	Design an Inverting and Non-Inverting adder circuit using IC-741 and check result both practically and theoretically.
7	Design a Subtractor circuit using IC-741 and check result both practically and theoretically.
8	Design an Integrator and Differentiator circuit using IC-741 and check its performance on CRO.
9	Design and assemble RC phase shift oscillator circuit and measure the frequency of oscillations.
10	To design and assemble Feedback amplifier circuits and find their input and output resistances. a. Voltage Series feedback circuit b. Voltage Shunt feedback circuit c. Current Series feedback circuit d. Current Shunt feedback circuit
11	To measure voltage gain of Complementary Symmetry Push Pull amplifier circuit.
12	To measure the voltage gain of Class C Power amplifier circuit.

NOTE: The actual number of experiments may be more than the above mentioned list.

Text Books/References

1. J.Millman & C.C.Halkias. Integrated electronics: analog and Digital circuits systems (TMH)
2. Jacob Millman and Arvin Grabel. Micro electronics. (McGraw Hill)
3. Robert L.Boyle sted and Louis Nashleshky. Electronic devices and circuit theory (PHI)