S Y L L A B U S

BACHELOR OF TECHNOLOGY

ELECTRONICS & COMMUNICATION

(Semester Scheme)

Four Year Degree Course

2014 - 2018

JODHPUR NATIONAL UNIVERSITY
JODHPUR

Faculty of Engineering & Technology
Jodhpur National University, Jodhpur
Syllabus Session – 2014-2018

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. II Year (Electronics & Communication Engineering)

III Semester

Course Code	Subject	Hrs./Week			Max. Marks		
		L	T	P	Main Exam (MM)	Int. Ass. (MM)	Total (MM)
A. Theory Papers							
BEC-301	Advanced Engg. Mathematics –I	3	1	-	80	20	100
BEC-302	Electronic Devices & Circuit – I	3	1	-	80	20	100
BEC-303	Circuit Analysis & Synthesis	3	1	-	80	20	100
BEC-304	Digital Electronics	3	1	-	80	20	100
BEC-305	Electronic Measurements & Instrumentation	3	1	-	80	20	100
BEC-306	Data Structures & Algorithms	3	0	-	80	20	100
GE 307 *	Special Mathematics-I**	3	1	-	80*	20*	100
B. Practicals & Sessionals							
BEC-307	EDC- I Lab	-	-	3	40	60	100
BEC-308	DE Lab	-	-	3	40	60	100
BEC-309	EMI Lab	-	-	3	40	60	100
BEC-310	DSA Lab	-	-	2	40	60	100
	Grant Total	**21**	**6**	**11**	**640**	**360**	**1000**

***Common for all branches (for Diploma Holders &/or transfer cases from other universities)**
**** It will be sessional paper: marks shall not be counted for awarding division how ever student has to pass this paper for award of degree.**

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. II Year (Electronics & Communication Engineering)

IV Semester

Course Code	Subject	Hrs./Week			Max. Marks		
		L	T	P	Main Exam (MM)	Int. Ass. (MM)	Total (MM)
A. Theory Papers							
BEC-401	Advanced Engg. Mathematics – II	3	1	-	80	20	100
BEC-402	Electronic Devices & Circuit - II	3	1	-	80	20	100
BEC-403	Electro Magnetic Field Theory	3	1	-	80	20	100
BEC-404	Microprocessor & Interfaces	3	1	-	80	20	100
BEC-405	Transmission Line Theory & Application	3	1	-	80	20	100
BEC-406	Object Oriented Prog.	3	-	-	80	20	100
GE-407 *	Special Mathematics-II**	3	1	-	80*	20*	100
A. Practicals & Sessionals							
BEC-407	EDC – II Lab	-	-	3	40	60	100
BEC-408	Microprocessor Lab	-	-	3	40	60	100
BEC-409	OOPs Lab	-	-	2	40	60	100
BEC-410	Electronic workshop	-	-	3	40	60	100
	Grant Total	**21**	**1**	**11**	**640**	**360**	**1000**

***Common for all branches (for Diploma Holders &/or transfer cases from other universities)**
**** It will be sessional paper: marks shall not be counted for awarding division how ever student has to pass this paper for award of degree.**

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. III Year (Electronics & Communication Engineering)

V Semester

Course Code	Subject	Hrs./Week			Max. Marks		
		L	T	P	Main Exam (MM)	Int. Ass. (MM)	Total (MM)
Theory Paper							
BEC-501	Signals & Systems	3	1	-	80	20	100
BEC-502	Linear Integrated Ckts.	3	1	-	80	20	100
BEC-503	Telecommunication Engg.	3	1	-	80	20	100
BEC-504	Analog Communication Theory	3	1	-	80	20	100
BEC-505	Microwave Engg. – I	3	1	-	80	20	100
BEC-506 BEC-506.1 BEC-506.2 BEC-506.3	**Elective** Biomedical Instrumentation Random Variables & Stochastic Process Micro and Nano Electronic Material Science	3	1	-	80	20	100
Practical & Sessional							
BEC-507	Signal Processing Lab – I	-	-	2	40	60	100
BEC-508	Communication Lab	-	-	3	40	60	100
BEC-509	Microwave Engg Lab	-	-	3	40	60	100
BEC-510	Electronics Engg Design Lab	-	-	2	40	60	100
	Grant Total	18	6	10	**640**	**360**	**1000**

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. III Year (Electronics & Communication Engineering)

VI Semester

Course Code	Subject	Hrs./Week			Max. Marks		
		L	T	P	Main Exam (MM)	Int. Ass. (MM)	Total (MM)
Theory Paper							
BEC-601	Microwave Engg. –II	3	1	-	80	20	100
BEC-602	Advanced Microprocessor	3	1	-	80	20	100
BEC-603	Industrial Electronics	3	1	-	80	20	100
BEC-604	Digital Communication	3	1	-	80	20	100
BEC-605	Control System	3	1	-	80	20	100
BEC-606 BEC-606.1 BEC-606.2 BEC-606.3	**Elective (any one of the following)** Neural Networks Advanced Data Structure Optimization Tech.	3		-	80	20	100
Practical & Sessional							
BEC-607	Digital Communication Lab	-	1	3	40	60	100
BEC-608	Advanced Microprocessor Lab	-	-	3	40	60	100
BEC-609	Humanity	-	-	3	40	60	100
BEC-610	Industrial Electronics Lab	-	-	2	40	60	100
	Grant Total	18	6	11	**640**	**360**	**1000**

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. IV Year (Electronics & Communication Engineering)

VII Semester

Course Code	Course Title	Hrs./Week			Max. Marks		
		L	T	P	Exam	Int. A.	Total
Theory Paper							
BEC-701	Antenna & Wave Propagation	3	1	-	80	20	100
BEC-702	Digital Signal Processing	3	1	-	80	20	100
BEC-703	Wireless Communications	3	1	-	80	20	100
BEC-704	IC Technology	3	1	-	80	20	100
BEC-705	VLSI Design	3	1	-	80	20	100
BEC-706 BEC-706.1 BEC-706.2 BEC-706.3	**Elective (any one of the following)** Artificial Intelligence & Expert System Satellite Communication ITC & Cryptography	3	1	-	80	20	100
Practical & Sessional							
BEC-707	Signal Processing Lab - II	-	-	3	60	40	100
BEC-708	Wireless Communications Lab	-	-	3	60	40	100
BEC-709	Practical Training Seminar	-	-	3	60	40	100
BEC-710	Project Stage – I	-	-	2	60	40	100
	Grant Total	18	6	11			
						Grant Total	**1000**

Jodhpur National University, Jodhpur

Teaching and Examination Scheme
B. Tech. IV Year (Electronics & Communication Engineering)

VIII Semester

Course Code	Course Title	Hrs./Week			Max. Marks		
		L	T	P	Exam	Int. A.	Total
Theory Paper							
BEC-801	Digital Image Processing	3	1	-	80	20	100
BEC-802	Radar & TV Engineering	3	1	-	80	20	100
BEC-803	Optical Communication	3	1	-	80	20	100
BEC-804 BEC-804.1 BEC-804.2 BEC-804.3	**Elective (any one of the following)** VHDL Design Microcontroller and Embedded Systems Computer Networks	3	1	-	80	20	100
Practical & Sessional							
BEC-805	Digital Image Processing Lab	-	-	3	40	60	100
BEC-806	Industrial & Economic Management	-	-	2	40	60	100
BEC-807	VLSI & Optical Communication Lab	-	-	3	40	60	100
BEC-808	Project Stage – II	-	-	3	80	120	200
BEC-809	Topic Seminar	-	-	3	40	60	100
		12	4	14			
						Grant Total	**1000**

BEC-301 ADVANCE ENGG. MATHEMATICS-I

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	LAPLACE TRANSFORM	**Lectures Required:8** Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficient with special reference to the wave and diffusion equations.
II	FOURIER SERIES & Z TRANSFORM	**Lectures Required:7** Expansion of simple functions in Fourier series. Half range series, Change of intervals, Harmonic analysis. Z TRANSFORM - Introduction, Properties, Inverse Z Transform.
III	FOURIER TRANSFORM	**Lectures Required:8** Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.
IV	COMPLEX VARIABLES	**Lectures Required:6** Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy's theorem. Cauchy's integral formula.
V	COMPLEX VARIABLES	**Lectures Required:6** Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

Total Lecture Required: 35

Reference Books:

1. Chandrika Prasad:
   (a) Mathematics for Engineers : Prasad Mudralay.
   (b) Advanced Mathematics for Engineers: Prasad Mudralay.
2. B.S. Grewal - Higher Engineering Mathematics: Khanna Publication.
3. M. Ray, J.C.Chaturvedi & H.C.Saxena - A Text book of differential equation; Students Friends & Co.
4. J.N. Kappoor & H.C. Saxena - Mathematics; S.Chand & Co.
5. Gokhroo et al: Higher Engg Math - III Unique Books, Ajmer.
6. Gaur & Kaul - Engineering Mathematics Vol 1 & 11; J PH.
7. Johnson - Probability and statistics for Engineers Pearson education.

BEC-302 - ELECTRONIC DEVICES & CIRCUITS - I

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	Semiconductors	**Lectures Required:7** Review of band theory of solids, intrinsic semiconductors, generation & recombination of electrons & holes, thermal equilibrium. Doped semiconductors n + P types, Fermi level and carrier concentrations of n and P type semiconductors. Carrier mobility & conductivity, diffusion, continuity equation. Hall effect and its application.
II	Semiconductors diodes	**Lectures Required:7** Band structure of P-n junction, quantitative theory of p-n diode. Volt ampere characteristics and its temperature dependence. Load-line concept. Transition & diffusion capacitance of p-n junction diodes. Breakdown of junction on reverse-bias. Zener & avalanche breakdowns. Clipping & clamping circuits, voltage multipliers.
III	Junction Transistor	**Lectures Required:7** Transistor as a device in CB, CE and CC configurations & their characteristics Current components. Current gains: alpha beta & gama, operating point. Hybrid model, h-parameter equivalent circuits. Ebers-moll model. Biasing & Stablisation techniques. Thermal runaway, thermal stability. DC and AC analysis of CE, CB & CC amplifier transistor.
IV	Field Effect Transistors	**Lectures Required:8** JFET, & its characteristics, MOSFET: enhancement, depletion modes. Equivalent circuits and biasing of JFET's & MOSFET's. low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor.
V	Small signal Amplifiers at Low Frequency	**Lectures Required:7** Analysis of BJT and FET, DC and RC coupled amplifiers frequency response mid band gain, gain at low and high frequency. miller's theorem. Cascading transistor amplifiers, Darlington pair, emitter follower, source follower. Analysis of DC and differential amplifier.

Total Lecture Required: 36

Reference Books:

1. J. Millman & C.C. Halkias - Integrated Electronics; Tata Mc-Graw Hill. Pearson Education.
2. Robert Boylestad & L. Nashelsky - Electronic Devices and Circuit Theory.
3. Electronic Principles, Albert Malvino/ David J. Bates
4. Floyd- Electronic Devices. Pearson Education.

BEC303- CIRCUIT ANALYSIS & SYNTHESIS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	NETWORK THEOREMS AND ELEMENTS	**Lectures Required: 7** Thevenin's, Norton's, Reciprocity, Superposition, Compensation, Miller's, Tellegen's and maximum power transfer theorems. Networks with dependent sources. 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.
II	TRANSIENTS ANALYSIS	**Lectures Required:7** 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. Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in a circuit.
III	NETWORK FUNCTIONS	**Lectures Required: 7** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Procedure of finding network functions for general two terminal pair networks. Stability & causality.
IV	TWO PORT NETWORKS	**Lectures Required:8** Two port parameters and their interrelations – z-parameters, Yparameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port networks. Image parameters. Attenuation & phase shift in symmetrical T and p networks.
V	NETWORK SYNTHESIS	**Lectures Required:7** Hurwitz polynomial, positive real function, RL & RC networks synthesis, Foster First & Second form, Cauer forms.

Total Lecture Required: 36

Reference Books:

1. Kuo, Franklin F.- Network analysis and synthesis, II ed, 1999 Jhon Wiley & Sons.
2. Desoer, C. And Kuh, E.S.- Basic circuit theory, Mc Graw Hill.
3. Van Valkenburg, M.E. - Network Analysis, Prentice Hall, India.
4. Schaum's Outline series on circuit analysis.

BEC 304-DIGITAL ELECTRONICS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA	**Lectures Required:9** Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived 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.
II	DIGITAL LOGIC GATE CHARACTERISTICS	**Lectures Required:6** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.
III	MINIMIZATION TECHNIQUES	**Lectures Required:6** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques.
IV	COMBINATIONAL SYSTEMS	**Lectures Required:7** Combinational logic circuit design, half and full adder, substractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers.
V	SEQUENTIAL SYSTEMS	**Lectures Required:9** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring & Johnson counter. Counter applications. Registers: buffer register, shift register. Mealy & Moore Machines.

Total Lecture Required: 37

Reference Books:

1. Digital Principles & Applications A.P. Malivno & D.P. Leach-
2. Digital Circuit & Logic Design Morris Mano
3. Degital Systems, Tocci-
4. DDigital Design, Mano
5. Salihvanan

BEC305- ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	THEORY OF ERRORS	**Lectures Required:6** Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.
II	ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS	**Lectures Required:7** Electronic Voltmeter, Electronic MultiMeter, Digital Voltmeter, Component Measuring Instruments, Q meter, Vector Impedance meter, RF Power & Voltage Measurements. Measurement of frequency. Introduction to shielding & grounding
III	OSCILLOSCOPES	**Lectures Required:7** CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage & sampling Oscilloscopes. Curve tracers.
IV	SIGNAL GENERATION	**Lectures Required:8** Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis - Measurement Technique, Wave Analyzers, Frequency - selective wave analyser, Heterodyne wave analyser, Harmonic distortion analyser, Spectrum analyser.
V	TRANSDUCERS	**Lectures Required:8** Classification, Selection Criteria, Characteristics, Construction, Working Principles, Application of following Transducers- RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows. Diaphragms, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.

Total Lecture Required: 36

Reference Books:

1. Electronic Inst. & Measurement, H.S. Kalsi
2. Electronic Inst. & Measurement Techniques, W.D. Cooper
3. Electrical & Electronic Measurement & Inst. A.K. Sawhney.
4. Electronic Measurements F.E. Terman & J.M.Pettit
5. Electronic Instrumentation, S. Talbar & Upadhyay.

BEC-306 DATA STRUCTURES & ALGORITHMS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T- 0 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	PERFORMANCE MEASUREMENT	**Lectures Required:6** Space complexity and Time complexity, big oh, omega and theta notations and their significance. Linear Lists - Array and linked representation, Singly & Doubly linked lists. Concept of circular linked lists.
II	ARRAY & MATRICES	**Lectures Required:7** Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tri-diagonal, triangular, symmetric. Sparse matrices representation and its transpose.
III	STACKS	**Lectures Required:7** Representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc. Queues - Representation in array & linked lists, applications, circular queues.
IV	TREES	**Lectures Required:8** Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, post order, in order).Search Trees - Binary search tree, indexed-binary search tree, basic operation, AVL tree, B-tree.
V	GRAPHS	**Lectures Required:8** Representation of un weighted graphs, BFS, DFS, Minimum cost spanning trees, Single source shortest path. Sorting - Bubble sort, insertion sort, merge sort, selection sort, quick sort, heap sort.

Total Lecture Required: 36

Reference Books:

1. Data Structure in Pascal Harowitz & Sawhni: (BPB Publication)
2. Data Structures in C & C++ Harowitz & Sawhni: (BPB Publication)
3. Data structures using C & C++, Langran, Augenstein & tenenbaum : Prentice Hall of India.
4. Data structures Trembly & Sovensen: (Mc Graw Hill International)
5. Data structures Algorithms Ano AV, JE Horproft, JD Vilman - (Addision Wesley) Pearson Education.
6. Data Structures & Program Design in C, Kruse, Leung & Tondo: Pearson Education.

GE 307* Special Mathematics** I

(*Common for all branches CSE/ECE/IT/ME/CSE/CIVIL for Diploma Holders)

Teaching Hrs. Exam Hrs. 3 Hrs.
3L + 1T Total-100

Unit	Topics	Details of Coverage
I	**Trigonometry**	Trigonometric functions, simple identities, range and values of trigonometric functions, inverse functions, De movier's theorem, Euler's theorem. **Lectures Req : 6**
II	**Basic Algebra**	Binomial theorem for positive and negative index, logarithmic and simple properties, exponential, Logarithmic and trigonometric series. **Lectures Req : 6**
III	**Differential Calculus:**	Function, single variable and multivariable function, polynomial, trigonometric, logarithmic and exponential fun's, derivative of a function, elementary formulae. **Lectures Req : 6**
IV	**Differential Calculus:**	Derivative of sum and difference of two functions, derivative of product and quotient of two functions, logarithmic differentiation, partial differentiation. **Lectures Req : 6**
V	**Integral Calculus:**	Integration of a function standard integrals and properties, integration by substitution, Integration by parts, definite integral and properties. **Lectures Req : 6**

Total Lectures Req : 30

**** It will be sessional paper: marks shall not be counted for awarding division how ever student has to pass this paper for award of degree.**

BEC-307 ELECTRONICS DEVICES & CIRCUITS - I LAB

Teaching Hrs. - Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

1. 1. Study the following Instrument:
   (a) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using. Lissajous figures.
   (b) Function/Signal generators.
   (c) Digital multimeters. .
2. (a) To study and draw V-I characteristics of junction diode (Ge, Si).
   (b) Also calculate cut-in voltage reverse saturation current, static & dynamic resistance.
3. (a) To study and draw reverse characteristics of zener diode.
   (b) Study of zener diode as voltage regulator observe the effect of load changes on voltage regulation.
4. Application of diode as clipper and clamper.
5. To draw i/p and o/p characteristics of common-emitter transistor.
6. To draw i/p and o/p characteristics of common-base transistor.
7. To draw i/p and o/p characteristics of common-collector transistor.
8. To study the rectifier (half wave, full wave and bridge) and filter circuit. Also calculate theoretical & practical ripple factor for all configurations the.
9. To draw characteristics curve of JFET and measure of Idss & Vp
10. To draw characteristics curve of MOSFET
11. (a) To calculate the gain and plot the frequency response of single stage amplifier.
    (b) To calculate the gain & plot the frequency response of double stage RC coupled amplifier.

BEC-308 DIGITAL ELECTORNICS LAB

Teaching Hrs. Practical **Exam. Hrs. – 03 hrs**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

(Most of Experiments to be performed on bread board)

1. To study various logic gates & verify their truth table.
2. To realize all other gats using universal gats & verify truth table.
3. To verify Boolean postulated and de margins theorem.
4. To design half adder and full adder
5. To design half subtractor and full subtractor
6. Design full adder using two half adder.
7. Design full subtractor using two half subtractor
8. Design binary to gray converter (4 bit).
9. Design gray to binary converter (4 bit).
10. Design 4 in to 1multiplexer.
11. Study of R-S, J0K, D & T flip flops.
12. Design a 3-bit asynchronous counter (up/down) 3-bit only.

BEC – 309 ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

Teaching Hrs. Practical **Exam. Hrs. – 03 hrs**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENT

1. Measure earth resistance using fall of potential method.
2. Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel.
3. Measure unknown inductance capacitance resistance using following bridges
   (a) Anderson Bridge (b) Maxwell Bridge
4. To measure unknown frequency & capacitance using Wein's bridge.
5. Measurement of the distance with the help of ultrasonic transmitter & receiver.
6. Measurement of displacement with the help of LVDT.
7. Draw the characteristics of the following temperature transducers:
   (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
8. Draw the characteristics between temperature & voltage of a K type thermocouple.
9. Measure the speed of a Table Fan using stroboscope.
10. Measurement of strain/ force with the help of strain gauge load cell.
11. Study the working of Q-meter and measure Q of coils.
12. To study the working of Spectrum analyzer and determine the bandwidth of different signals.

EC – 310 DSA LAB

Teaching Hrs. Practical **Exam. Hrs. – 03 hrs**
P - 2 **Marks Practical Exam - 40 Sessional – 60 Total 100**

1. Simple array and sorting algorithm implementations.
2. Addition, multiplication and transpose of sparse matrices represented in array form.
3. Polynomial addition, multiplication (8th degree polynomials), using array & linked lists.
4. Implementation of stack and queue using array & linked lists.
5. Implementation of circular queue using array.
6. Infix to postfix/prefix conversion.
7. Binary search tree creation and traversing.
8. Generation of spanning trees for a given graph using BFS & DFS algorithms.
9. AVL tree implementation (creation, insertion, deletion).
10. Symbol table organization (Hash Table).

BEC-401 ADVANCE ENGG MATHEMATICS-II

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	NUMERICAL ANALYSIS	**Lectures Required:6** Finite differences – Forward, Backward and Central differences. Newton's forward and backward differences, interpolation formulae. Stirling's formula, Lagrange's interpolation formula.
II	NUMERICAL ANALYSIS-INTEGRATION-	**Lectures Required:7** Trapezoidal rule, Simpson's one third and three-eighth rules. Numerical solution of ordinary differential equations of first order - Picard's mathod, Euler's and modified Euler's methods, Miline's method and Runga-Kutta fourth order method., **Differentiation**
III	SPECIAL FUNCTIONS	**Lectures Required:8** Bessel's functions of first and second kind, simple recurrence relations, orthogonal property of Bessel's , Transformation, Generating functions, Legendre's function of first kind. Simple recurrence relations, Orthogonal property, Generating function.
IV	STATISTICS AND PROBABILITY	**Lectures Required:8** Elementary theory of probability, Baye's theorem with simple applications, Expected value, theoretical probability distributions-Binomial, Poisson and Normal distributions. Lines of regression, co-relation and rank correlation.
V	CALCULUS OF VARIATIONS	**Lectures Required:7** Functional, strong and weak variations simple variation problems, the Euler's equation.

Total Lectures Req : 36

Reference Books:

1. Chandrika Prasad
   (a) Mathematics for Engineers; Prasad Mudralaya
   (b) Advanced Mathematics for Engineers; Prasad Mudralaya
2. Higher Engineering Mathematics, B.S. Grewal
3. Engineering Mathematics, Gaur & Kaul

BEC-402 – ELCTRONICS DEVICES & CIRCIUTS-II

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	FEEDBACK AMPLIFIERS	**Lectures Required:7** 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 amplifier. Stability criterion.
II	OSCILLATORS	**Lectures Required:7** Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable Multivibrators. Schmitt trigger. Blocking oscillators.
III	HIGH FREQUENCY AMPLIFIERS	**Lectures Required:6** Hybrid Pi model, conductance and capacitances of hybrid-Pi model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies.
IV	TUNED AMPLIFIER	**Lectures Required:8** Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET. Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier. Shunt Peaked Circuits for Increased Bandwidth.
V	POWER AMPLIFIERS	**Lectures Required:7** Power amplifier circuits, Class A output stage, class B output stage and class AB output stages, class C amplifiers, push pull amplifiers with and without transformers. Complementary symmetry & quasi complimentary symmetry amplifiers

Total Lectures Req : 35

Reference Books:

1. Integrated Electronics J. Millman & C.C. Halkias
2. Electronics Devices and Circuit Theory Robert Boylestad & L. Nasheisky.
3. Microelectronics circuits, Sedra Smith.

BEC-403 ELECTROMAGNETIC FIELD THEORY

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INTRODUCTION**	**Lectures Required:7** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's & Stoke's theorems.
II	**ELECTROSTATICS**	**Lectures Required:8** 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 images. Boundary conditions. Field mapping and concept of field cells.
III	**MAGNETOSTATICS**	**Lectures Required:8** Magnetic field intensity, flux density & magnetization, Faraday's Law, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field maping and concept of field cells.
IV	**TIME VARYING FIELDS**	**Lectures Required:6** 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 Uniform Plane Wave, standing wave ratio. Pointing vector and power considerations.
V	**RADIATION, EMI AND EMC**	**Lectures Required:7** Retarded Potentials and concepts of radiation, Radiation from a small current element. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.

Total Lectures Req : 36

Reference Books:

1. Griffths- Introduction to Electrodynamics. (2/e Prentice Hall of India)
2. V.V. Sarwate- Electromagnetic fields and waves, Willey Eastern, Ltd.
3. J.D. Kraus- Electromagnetic, McGraw Hill.
4. W.H. Hayt Jr. - Engineering Electromagnetic, Tata McGraw Hill.
5. Cheng - Field & wave Electromagnetic, Pearson Edudation.

BEC-404 MICROPROCESSOR & INTERFACES

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**Introduction**	Introduction to microprocessor, microcomputer & microcontroller & their comparison. CPU, address bus, data bus & control bus. Buffers, encoders & latches. memory mapping & memory interfacing. Different factures of 8085 & 8086 (comparative study only). **Lectures Required: 8**
II	**8085 Architecture**	Schematic & pin diagram of 8085. Functional block diagram of 8085. Internal data operation. Registers of 8085. denultiplexing of AD_0-AD_7. Generation of control signals **Lectures Required: 8**
III	**8085 Instructions of Programming**	Difference between low level, assembly & high level language. Instruction set of 8085. Instruction format & timing diagrams. Addressing modes. Writing assembly language program & debugging. **Lectures Required: 8**
IV	**8085 Interrupt Stack & Subroutine**	Interrupts of 8085. Interrupt structure stack & subroutine. Instructions related to stack. Counter & delay. Different techniques for generation of delay & calculations. **Lectures Required: 5**
V	**8085 Interfacing with Peripherals & Introduction to 8051 Microcontroller**:	Interfacing with 8255(PPI), 8253 (PIT), 8257 (DMA), 8259 (PIC), 8279 (Key board Display Controller) and their application. . Writing the initialization instructions. Introduction to microcontroller (8051). **Lectures Required: 7**

Total Lectures Req : 36

Reference Books:

1. Microprocessor Arch. Prog., Ramesh Gaonkar.
2. Microprocessor & Interfacing, B. Ram
3. The 8051 Microcontroller, Kenneth J. Ayala

BEC - 405 TRANSMISSION LINE THEORY & APPLICATIONS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T- 1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	TRANSMISSION LINE	**Lectures Required:8** Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection in 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 lines of other lengths,
II	TRANSMISSION LINE APPLICATIONS	**Lectures Required:7** Smith chart and its application. Transmission line applications, Impedance matching Network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.
III	ATTENUATORS & FILTERS	**Lectures Required:7** Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, π section & T -section attenuators, stub matching, Transmission equalizers Filters, constant K-section, Ladder type, π section, T-section filter, m-derived filter sections, Lattices filter section.
IV	TELEPHONE TRANSMISSION	**Lectures Required:6** Telephone set, Touch tone dial types, two *wire* four wire' transmission, Echo suppressors & cancellors, cross talk. Multi-channel systems: Frequency division & time division multiplexing
V	AUTOMATIC TELEPHONY & TELEGRAPHY	**Lectures Required:8** Trunking concepts, Grade of service, Traffic definitions, Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange, EPABX and SPC Digital telephone Exchange, Numberig Plan, Fascimile services.

Total Lectures Req : 36

Reference Books:

1. Electromagnetic Theory & Transmission Lines, Umesh Sinha
2. Transmission Line Theory & Application, NN Biswas

BEC-406 OBJECT ORIENTED PROGRAMMING

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	OOP FUNDAMENTALS	**Lectures Required:6** Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance
II	PROGRAMMING IN C++	**Lectures Required:8** Enhancements in C++ over C, Data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading. Working with class and derived classes. Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects. Input output flags and formatting operations. Working with text files.
III	JAVA	**Lectures Required:7** Variation from C++ to JAVA. Introduction to Java byte code, virtual machine, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations.
IV	OPERATORS AND CONTROL STATEMENTS	**Lectures Required:7** Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, ?: operators, operator precedence. Switch and loop statements.
V	PACKAGE AND INTERFACES	**Lectures Required:7** Packages, access protection, importing & defining packages. Defining and implementing interfaces.

Total Lectures Req : 35

Reference Books:

1. Folk: File Structures : An Object Oriented Approach to C++, Pearson Education.
2. Patric Naughton: Java 2, Tata Mc-Graw Hill.
3. C Gottried: programming in C, Schaum Series, Tata Mc- Graw Hill.
4. Balaguruswamy: Object Oriented Programming in C++, Tata Mc - Graw Hill.
5. Booch G.: Object Orientd Analysis & Design, Benjamin- Commings.
6. Rumbaugh J. Et. al: Object Oriented Modelling & Design, Prentice Hall of India.
7. Deited: Java: How to Programme, Pearson Education.
8. Kelley : A Book on C. Pearson Education.

GE 407* Special Mathematics** II

(Common for all branches CSE/ECE/IT/ME/CSE/CIVIL for Diploma Holders)

Teaching Hrs. Exam Hrs. 3 Hrs.
3L + 1T Total-100

Unit	Topics	
I	**Differential equation of first Order**	Definition, order and degree of differential equation, Method of separation of variable, Homogeneous differential equation. **Lectures Req : 6**
II	**Differential equation of first Order**	Exact differential equation of first order, Reducible to exact form, Linear form, Reducible to linear form. **Lectures Req : 6**
III	**Differential equation of second Order**	Linear differential equation with constant coefficients, complementary function, particular integral **Lectures Req : 6**
IV	**Elementary Complex variable**	Complex Numbers, Real and imaginary parts of complex, complex conjugate, modulus and argument of complex number. Euler's theorem and De'moivre's theorem (only statement) polar form of complex number. **Lectures Req : 6**
V	**Matrices and Determinants**	Determinants and Matrices of order two and three properties of determinants, Evaluation of Determinants, Addition, Subtraction, Multiplication, Transpose, Adjoint and inverse of Matrix. **Lectures Req : 6**

Total Lectures Req : 36

**** It will be sessional paper: marks shall not be counted for awarding division how ever student has to pass this paper for award of degree**

BEC-407 ELECTRONICS DEVICES & CIRCUITS - II LAB

Teaching Hrs. Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENT

1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2. Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3. Plot and study the characteristics of small signal amplifier using FET.
4. Study of push pull amplifier. Measure variation of output power & distortion with l load.
5. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency
6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7. Study the following oscillators and observe the effect of variation of C on oscillator frequency:
   (a)Hartley
   (b) Colpitts
8. Design Fabrication and Testing of k-derived filters (LP/HP).
9. Study of a Digital Storage CRO and store a transient on it.
10. To plot the characteristics of UJT and UJT as relaxation.
11. To plot the characteristics of MOSFET and CMOS.

BEC-408 MICROPROCESSOR LAB

Teaching Hrs. Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

Write assembly language program

1. To add two 8 bit nos & result may be 8 bit. Store result in memory.
2. To add two 8 bit nos & result may be 16 bit. Store result in memory.
3. To find largest of two nos , three nos & largest from array.
4. To find smallest from two nos , three nos & smallest from array.
5. To transfer block of bytes from one set of memory location to another set of memory location (in same order (b) in reverse order.
6. To perform multibyte to addition in hex & in decimal.
7. To perform multi by to subtraction in hex.
8. To generate 10 terms of feboracci series in hex & in decimal.
9. To arrange given data array in ascending order
10. To arrange given data array in descending order.
11. To swap two block of bytes.
12. To generate a table of given no. in decimal.

BEC - 409 OOPS LAB

Teaching Hrs. Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

Programs in C++

1. Write a program to perform the complex arithmetic.
2. Write a program to perform the rational number arithmetic.
3. Write a program to perform the matrix operations. (Transpose, addition, subtraction, multiplication, Test if a matrix is symmetric lower triangular/ upper triangular)
4. Implement Morse code to text conversion and vice-versa.
5. To calculate Greatest Common Divisor of given numbers.
6. To implement tower of Hanoi problem.

Program in Java

7. To implement spell checker using dictionary.
8. To implement a color selector from a given set of colors.
9. To implement a shape selector from a given set of shapes.
10. By mapping keys to pens of different colors, implement turtle graphics.
11. To implement a calculator with its functionality.
12. To implement a graph and display BFS/DFS order of nodes.

BEC - 410 ELECTRONICS WORKSHOP

Teaching Hrs. Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

1. Identification, Study & Testing of various electronic components :
   (a) Resistances-Various types, Colour coding (b) Capacitors-Various types, Coding, (c) Inductors
   (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR
   (l) Potentiometers
2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc.
3. To study and perform experiment on CRO demonstration kit.
4. Soldering & desoldering practice.
5. (a) To Design & fabricate a PCB for a Regulated power supply.
   (b) Assemble the Regulated power supply using PCB and test it.
6. To study and plot the characteristics of following Opto-Electronic devices –
   (a) LED (b) LDR (C) Photovoltaic cell (d) Opto-coupler
   (e) Photo diode (f) Photo transistor (g) Solar cell
7. To study the specifications and working of a Transistor radio kit and perform measurements on it.
8. To study the specifications and working of a Tape Recorder kit.
9. To prepare design layout of PCBs using software tools.
10. To fabricate PCB and testing of electronics circuit on PCB.
11. To design and test regulated power supply using ICs
12. To study the specifications and working of a VCD Player.
13. To study the specifications and working of color TV.

BEC-501 SIGNALS AND SYSTEMS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INTRODUCTION**	**Lectures Required:8** Continuous time and discrete time systems, Properties of systems. Linear time invariant systems - continuous time and discrete time. Properties of LTI systems and their block diagrams. Convolution, Discrete time systems described by difference equations.
II	**FOURIER SERIES REPRESENTATION OF SIGNALS**	**Lectures Required:7** 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.
III	**FOURIER TRANSFORM**	**Lectures Required:7** The continuous time Fourier transform for periodic and aperiodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and aperiodic signals. Properties of DTFT. The convolution and modulation property.
IV	**Z-TRANSFORM & LAPLACE TRANSFORM**	**Lectures Required:7** Introduction. The region of convergence for the Z-transform. The Inverse Z-transform. Two dimensional Z-transform. Properties of Z transform. Laplace transform, Properties of Laplace Transform, Application of Laplace transform to system analysis.
V	**SAMPLING**	**Lectures Required:7** 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.

Total Lectures Required: 36

Reference Books:

1. Signal Processing and Linear System, B.P. Lathi
2. Signals & Systems, Simon Haykin
3. Signals & Systems, Oppenhim Willsky
4. Fundamentals of Signals and Systems: M.J. Roberts

BEC-502 LINEAR INTEGRATED CIRCUITS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**Operational Amplifiers**	Basic differential amplifier, Single ended and double ended configurations, Op-Amp configurations with feedback, Ideal & practical characteristics of Op-amp block diag. of Op-Amp. Inverting & non - Inverting configuration of Op-Amp. **Lectures Required:8**
II	**Operational Amplifier Applications**	Adder, subtractor, Differentiator, Integrator phase shift oscillator, wein bridge oscillator, square wave generator, triangular wave, voltage controlled oscillator, voltage to frequency & frequency to voltage converters comparator & zero crossing detector **Lectures Required:8**
III	**Active Filters using Op - Amp**	Low pass filter, high pass filter, band pass filter, band reject filters, All pass filter, Switched capacitor filter, Butterworth filter, Chebyshev Filter. **Lectures Required:6**
IV	**Phase-Locked Loops (PLL)**	Operating Principles of PLL, block diag. of PLL, Lock range & capture range, Applications of PLL as FM detector, AM detector, FSK demodulator, frequency translator & frequency trading filter, monolithic PLL LM 565. **Lectures Required:8**
V	**Linear IC's**	Basic block diagram of voltage regulator IC. Three terminal voltage regulator. Positive and negative voltage regulators. Block diag. of 555 timer. Timer as a bistable, mono sable & astable multivibrators. Timer as a Schmitt trigger. Waveforms & calculation of time constant & duty cycle. **Lectures Required:8**

Total Lectures Required: 38

Reference Books:

1. Op-Amps and Linear Integrated Circuits, Gaykwad, Ramakant A.
2. Linear Integrated Circuits, Botkar
3. Linear Circuits: Analysis and Synthesis, A. Ramakalyan
4. Linear Integrated Circuits, Nair

BEC - 503 TELECOMMUNICATION ENGINEERING

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	EVOLUTION OF TELE-COMMUNICATION	**Lectures Required:8** Basic Switching System, Simple Tele-phone Communication, Telephone Transmitter, Telephone receiver, Telephone's bell & dialer pulsing mechanism, subscribers telephone sets, Dialing types, signaling tones., Brief Introduction to Electromagnetic Exchanges
II	ELECTRONIC SWITCHING	**Lectures Required:7** Space Division Switching Stored Programme Control – Centralized SPC, Distributed SPC, Software Architecture, Application Software – Enhanced Services, Multi Stage Switching Networks.
III	TIME DIVISION SWITCHING	**Lectures Required:7** Time Division space switching, Time Division Time Switching, Time multiplexed space switching, Time multiplexed Time Switching, Combination Switching Traffic Engineering, Grade of Service and Blocking Probability - Telephone Networks, Subscriber Loops, Switching Hierarchy and Routing, Signaling Techniques, In Channel, Common Channel. Transmission media.
IV	FAX SYSTEM	**Lectures Required:7** Basic facsimile system, facsimile applications working of FAX machines, recording media, FAX reproduction technique.
V	MOBILE RADIO COMMUNICATION	**Lectures Required:7** Introduction, cellular structures & planning, Frequency allocation, propagation Problems, Base station antennas, Mobile unit antenna Type of mobile systems, Handoffs, Analog cellular Radio Digital Cellular radio, Digital Narrow band TDMA, CDMA technology.

Total Lectures Required: 36

Reference Books:

1. Telecommunication Switching Systems & Networks, Thiagrajan Vishwanathan
2. Telecommunication Switching, Traffic & Networks, Flood
3. Telecommunication System Engineering, Roger L. Freeman
4. Telecommunication Switching of Network, P. Gnanasivom

BEC - 504 ANALOG COMMUNICATION THEORY

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	NOISE EFFECTS IN COMMUNICATION SYSTEMS	**Lectures Required:7** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.
II	AMPLITUDE MODULATION	**Lectures Required:8** Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.
III	FREQUENCY MODULATION	**Lectures Required:7** Phase & frequency modulation & their relationship, Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers.. Comparison of AM, FM & PM. Pre emphasis & de-emphasis. Threshold in FM, PLL demodulator.
IV	NOISE IN AM AND FM	**Lectures Required:7** Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of *SIN r*atio in FM demodulators.
V	PULSE ANALOG MODULATION	**Lectures Required:6** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM

Total Lectures Required: 36

***Reference Books:*:**

1. Principles of Communication Systems H. Taub & D.L. Schilling
2. Electronic Communication Systems, G. Kennedy, Davis
3. Communication Systems Simon Haykin
4. Communication Systems B.P. Lathi

BEC - 505 MICROWAVE ENGINEERING-I

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	WAVE GUIDES	**Lectures Required:8** Introduction of Microwaves and their applications. Rectangular Waveguides , Solution of Wave equation in TE and TM modes. Power transmission and Power losses. Excitation of modes in Rectangular waveguides, circular waveguides : Basic idea of TE and TM modes, field patterns, TEM mode of propagation.
II	WAVEGUIDE COMPONENTS	**Lectures Required:7** Scattering matrix representation of networks. Rectangular cavity and circular cavity resonators. Waveguide Tees, Magic Tees. Hybrid rings. Waveguide corners, Bends and twists. Directional couplers, Circulators and isolators.
III	KLYSTRONS	**Lectures Required:8** Limitation of conventional vacuum tubes, Construction and operation of two cavity & multicavity klystrons. Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity klystrons. Construction, working and operation of Reflex klystron. Applications and practical considerations. Velocity modulation, power output and frequency characteristics of a Reflex klystron. Electron admittance.
IV	TRAVELLING WAVE TUBES (TWT)	**Lectures Required:7** Construction, operation and practical consideration of helix type TWT. Introduction to CW power, pulsed dual mode TWT. Coupled cavity TWT. Applications of TWT.
V	MAGNETRON	**Lectures Required:6** Types of Magnetron. Construction, operation, analysis and practical consideration of cavity or travelling wave magnetron. Introduction to coaxial, frequency angle and voltage tunable magnetrons. Backward cross field oscillator, Forward wave cross field amplifier.

Total Lectures Required: 36

Reference Books:

1. Microwave devices & Circuits, S. Liao
2. Microwave & Radar Engg, Kulkarni
3. Microwave Circuits and Passive Devices, N.L. Sisodia & G.S. Raguswami
4. Microwave principles, Herbert Joseph Reich

BEC 506.1 BIOMEDICAL INSTRUMENTATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	HUMAN BODY SUBSYSTEMS	**Lectures Required:8** Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities. transducers and electrodes: Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.
II	BIOPOTENTIALS	**Lectures Required:8** Electrical activity of excitable cells, ENG, EMG, ECG, ERG, EEG. Neuron potential. Cardiovascular system measurements: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.
III	INSTRUMENTATION FOR CLINICAL LABORATORY	**Lectures Required:7** Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O2 and CO2 concentration in blood, GSR measurement. Instrumentation for clinical laboratory: Spectrophotometry, chromatography, Hematology, Measurement of pH value, concentration in blood. Medical Imaging: Diagnostic X-rays, CAT, MRI, thermography, Ultrasonography, medical use of isotopes, endoscopy.
IV	PATIENT CARE, MONITORING AND SAFETY MEASURES	**Lectures Required:7** 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 applications, data acquisition and processing, remote data recording and management.
V	THERAPEUTIC AND PROSTHETIC DEVICES	**Lectures Required:6** Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser.

Total Lectures Required: 36

Reference Books:

1. Bio-medical Instrumentation, Chvombell
2. Bio-medical Instrumentation, K.R. Nahar
3. A Handbook of Bio-medical Instrumentation, Khondpur
4. Medical Instrumentation, J. G. Webster

BEC 506.2 RANDOM VARIABLES & STOCHASTIC PROCESSES

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	PROBABILITY	**Lectures Required:6** Definitions, sample, space & events, joint & conditional probability, dependent events
II	RANDOM ARIABLES	**Lectures Required:8** Introduction, distribution & density functions, discrete & continuous random variables, special distributions: binominal, poisson, uniform, exponential, normal, rayleigh.conditional distribution & density functions
III	MULTIPLE RANDOM VARIABLES	**Lectures Required:8** Vector random variable, joint distribution functions, joint probability density function, conditional distribution & density functions. Statistical independence, distribution & density function of sum of random variable, one function of one random variable, one function of two random variable, two function of two random variable.
IV	OPERATION ON SINGLE & MULTIPLE RANDOM ARIABLES	**Lectures Required:7** Mean & ariance, moments, chebyshev's inequality, Central limit theorem, characteristic functions & moment generating function, covariance & correlation coefficient of multiple random variable.
V	STOCHASTIC PROCESSES	**Lectures Required:7** Introduction, random process concept, stationary & independence, ergodicity, correlation, functions. Gaussion Random Process, Transmission of Random process through linear systems. Power spectral Density, Cross Spectral density

Total Lectures Required: 36

Reference Books:

1. Cllasical Electrodynamics, Jackson,
2. Statistics And Random Processes, Veerarajan,
3. Random Variables And Random Signal Principles, Peebles
4. Random Variables And Random Signal Principles, Peebles

BEC 506.3 MICRO AND NANO ELECTRONIC MATERIAL SCIENCE

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**Introduction**	**Lectures Required:7** Material properties. Liquid crystals, polymers, biomaterials, ceramics, superconductivity, thin films. Structure property relationships – Microstructure, substructure, atomic structure, density and porosity, imperfections, thermal expansion, thermal conductivity, mechanical strength, electrical conductivity, absorption, reflection and transmission, luminescence.
II	Catalysis & Phase transitions	**Lectures Required:6** General principles, classification homogenious, heterogeneous & enzyme catalysis, physisorption, chemisorption, examples of industrial applications. Classification based on order with examples, Phase transformation, examples
III	**Materials Metals, alloys & semiconductors**	**Lectures Required:8** Some special alloys, shape memory alloys – concepts, terminologies, examples & applications. Properties of alloys. Magnetic materials. Semiconductors–solarcells and lasers. Advanced ceramics and glasses: Structure, processing and grain growth, properties, examples and applications. High temperature ceramic superconductors. Dielectric materials – Ferroelectricity and piezoelectricity. Introduction to different types of glasses. Polymers and composites: Polymers: classification, processing, properties, advanced polymers – conducting polymers, applications. Composites : General introduction, matrix and reinforcing materials, classification, fabrication, structure, properties. Examples for advanced composites- Applications.
IV	**Techniques Materials characterization techniques**	**Lectures Required:8** Brief introduction to mechanical testing of materials and non -destructive testing of materials. Micro structural investigation: Metallurgical microscope, grain size. Sophisticated analytical techniques: Electron microscopy: Transmission electron microscopy (TEM), Scanning electron microscopy (SEM). Atomic and molecular spectroscopies: Principles of atomic absorption, infra-red, and Raman spectroscopies for the determination of impurities. Low energy electron diffraction (LEED), X- ray photoelectron spectroscopy (XPS/ESCA) and Auger Electron analysis. Energy dispersive analysis of X- rays (EDAX). Thermal analysis: Principles of differential scanning calorimeter, thermal mechanical analyzer
V	**Nanotechnology**	**Lectures Required:7** Nanomaterial synthesis, substrate effect, modification of surfaces, organization, specific examples, applications –biosensors, gas sensors, thermal sensors.

Total Lectures Required: 36

Reference Books:

1. 1. Lawrence H. Van Vlack, (1998) ―Elements of Materials Science and Engineering,.
2. 2. William F., Smith (1988) ―Fundamentals of Materials Science and Engineering McGraw Hill
3. 3. Michael Shur (1998) ―Physics of semiconductor devices –Prentice hall of India.
4. 4. Review articles from IEEE journals

BEC-507 SIGNAL PROCESSING LAB – I

Teaching Hours Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

Simulation in MATLAB Environment:

1. Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression.
2. Generation of Continuous and Discrete Unit Step Signal.
3. Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4. Continuous and discrete time Convolution (using basic definition).
5. Adding and subtracting two given signals. (Continuous as well as Discrete signals)
6. To generate uniform random numbers between (0, 1).
7. To generate a random binary wave.
8. To generate random sequences with arbitrary distributions, means and variances for following :
   (a) Rayleigh distribution
   (b) Normal distributions: N(0,1).
9. To plot the probability density functions. Find mean and variance for the above distributions
10. To find output of LTI system (continuous/discrete)

BEC-508 COMMUNICATION LAB

Teaching Hours Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

1. Observe the Amplitude modulated wave form & measure modulation index.
2. Demodulation of AM signal.
3. Generation & Demodulation of DSB - SC signal.
4. Modulate a sinusoidal signal with high frequency carrier to obtain FM signal
5. Demodulation of the FM signal.
6. To observe the following in a transmission line demonstrator kit:
   (a) The propagation of pulse in non reflecting transmission line.
   (b) The effect of losses in transmission line.
   (c) Transmission with standing waves on a Transmission line.
   (d) The resonance characteristics of a half-wave length long X-mission line.
7. To observe pulse modulation; the operation of sampling and sample & hold circuits.
8. To study the effect of sampling time (sampling pulse width)
9. To study the effects of changing the sampling frequency & observing aliasing phenomena.
10. To study & observe the operation of a super heterodyne receiver (SHR)
11. To study & observe the amplitude response of automatic gain controller (AGC) in SHR.
12. PAM, PWM & PPM: Modulation and demodulation.

BEC-509 MICROWAVE ENGINEERING LAB

Teaching Hours Practical **Exam. Hrs. – 03**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

1. Study of various microwave components and instruments like frequency meter, attenuator, detector & VSWR meter.
2. Draw V-I characteristics of microwave source like Gunn diode! Reflex Klystron.
3. Measurement of frequency and wavelength in a rectangular waveguide.
4. Measurement of VSWR (small as well as large values) & reflection coefficient.
5. Measure an unknown impedance with smith chart.
6. Draw the following characteristics of Gunn Diode
   (i) Output power and frequency as a function of voltage
   (ii) Square wave modulation by PIN diode.
7. Drawing polar pattern of Horn antenna.
8. To observe the action of directional coupler and its use in separating incident & reflected wave.
9. Study of Magic Tee, Circulator, Isolator
10. Study of spectrum analyzer & its use in observing the response of
    (i) High frequency amplifier
    (ii) Low pass, high pass, band pass, band reject filters.

BEC -510 ELECTRONIC ENGINEERING DESIGN LAB

Teaching Hours Practical **Exam. Hrs. – 03**
P - 2 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

To design the following circuits, assemble on bread board and observe output on CRO: :

1. Op-Amp as an inverting amplifier.
2. Op-Amp as a nm inverting amplifier.
3. Op-Amp as a differentiator.
4. Op-Amp as an integrator.
5. Op-Amp as a adder.
6. Op-Amp as a subtrator
7. Op-Amp as a LPF
8. Op-Amp as a HPF
9. Design astable multivibrator 555.
10. Application based project using Op-Amp.

EC601-MICROWAVE ENGINEERING-II

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**MICROWAVE MEASUREMENTS**	**Lectures Required:7** Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements.
II	**MICRO STRIP LINES**	**Lectures Required:7** Introduction to microstrip lines, Parallel strip lines, Coplanar strip lines, Shielded strip lines, Slot lines, Integrated Fin line, Non-radiative guide, Transitions, Bends and Discontinuities.
III	**MICROWAVE NETWORK ANALYSIS**	**Lectures Required:8** Impedance and Admittance matrices, Scattering matrix, Reciprocal networks and Loss less networks parameters, ABCD Matrix, Equivalent circuits for Two port Network, Conversions between two port network Signal flow graphs, Discontinuities in waveguides and microstrip.
IV	**MICROWAVE SEMICONDUCTOR DEVICES**	**Lectures Required:7** Construction, Operation and Practical applications of PIN diode, varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.
V	**MONOLITHIC MICOWAVE INTEGRATED CIRCUITS**	**Lectures Required:7** Introduction, Materials, MMIC Growth, MOSFET fabrication, Thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.

Total Lectures Required: 36

Reference Books:

1. Microwave Devices & Circuits, S. Liao
2. Microwave & Radar Engg, Kulkarni
3. Microwave Circuits and Passive Devices, N.L. Sisodia & G.S. Raguswami
4. Microwave Propagation and Techniques, D.C. Sarkar

EC 602- ADVANCE D MICROPROCESSOR

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**Introduction**	Difference between microprocessor, microcomputer & microcontroller. Introduction to advanced microprocessor. 4 bit, 8 bit, 16 bit & 32 bit microprocessor. RISC & CISC processors. Virtual memory concept. Assemble directions SISD, SIMD, MIMD & MISD. **Lectures Required:8**
II	**8086 Architecture**	Pin diagram & architecture of 8086. bus interface unit & execution unit. Minimum & maximum mode of 8086. pipe lining & segmentation. Address & data bus (A Do – A Dis) & address/status signals. Demutiplexing of A Do – A Dis & A 16 – A 19 & status signals. Generation of control signals. Differences & similarities between 8086/8088. **Lectures Required:8**
III	**8086 Microprocessor Instruction & Programming**	Instruction set of 8086. classification & addressing modes of 8086. Courting assembly language programs. Timing diagram for read & write cycle in minimum & maximum mode. **Lectures Required:7**
IV	**8086 Interrupts & Stack & Subroutine**	Interrupts of 8086. Interrupt vector table, assembler directives. Stack structure of 8086. calling a subroutine. Comparative study of 80186, 80286 & 80386. **Lectures Required:7**
V	**8086 Interfacing with Peripherals**	Interfacing of A/D & D/A converter DMA controller (8257). Programmable communication interface (8251), key board display controller (8279) **Lectures Required:6**

Total Lectures Required: 36

***Reference Books*:**

1. Microprocessor and Interfacing, Douglus Hall.
2. Advanced Microprocessor & Peripherals, A.K. Ray Bhurchandi
3. Microprocessors Interfacings And Applications, B.P. Singh Renu Singh
4. Microprocessor Theory and Applications with 68000/68020 and Pentium, M. Rafiquzzaman

EC 603- INDUSTRIAL ELECTRONICS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-0 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	SEMICONDUCTOR POWER DEVICES	**Lectures Required:7** Basic characteristics & working of Power Diodes, Diac, SCR, Triac, Power Transistor, MOSFETs, IGBT, and GTO.
II	RECTIFIERS & INVERTERS	**Lectures Required:7** Working principles of single and three phase bridge rectifiers, Voltage and current source inverters.
III	POWER SUPPLIES	**Lectures Required:8** Principle of operation of choppers. Step up, Step down and reversible choppers. High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.
IV	MOTOR CONTROL	**Lectures Required:7** Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.
V	STEPPER MOTORS	**Lectures Required:7** Variable reluctance, Permanent magnet and hybrid stepper motors. Induction and dielectric heating control.

Total Lectures Required: 36

***Reference Books*:**

1. Power Electronics, P.S. Bimbhra
2. Power Electronics, M. Rashid
3. Industrial Electronics, J.S. Chitode

EC 604 - DIGITAL COMMUNICATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	PCM & DELTA MODULATION SYSTEMS	**Lectures Required:7** PCM and delta modulation, Quantization noise in PCM and delta modulation. Signal-to-noise ratio in PCM and delta modulation, Adaptive delta. Modulation. Bit, word and frame synchronization, T1 Carrier System, Matched filter detection. Error probability in PCM system.
II	BASE BAND TRANSMISSION	**Lectures Required:7** Line coding(RZ,NRZ): Polar,Bipolar,Manchester,AMI. Inter symbol interference, Pulse shaping, Nyquist criterion, Raised cosine spectrum
III	DIGITAL MODULATION TECHNIQUES	**Lectures Required:7** Geometric interpretation of signals, Orthogonalization. ASK, BPSK, BFSK, QPSK, MSK modulation techniques and Coherent detection of these techniques. Calculation of error probabilities.
IV	INFORMATION THEORY	**Lectures Required:7** Amount of Information, Average 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,
V	CODING	**Lectures Required:8** Coding and decoding of Information, Shanon Fano, Huffman code techniques, Hamming code, Single Parity-Bit Code, Linear Block code, cyclic code & convolutional code.

Total Lectures Required: 36

***Reference Books*:**

1. Communication Systems Analog and Digital, R.P. Singh, S.D. Sapre.
2. Modern Digital and Analog Comm. System, B.P. Lathi
3. Digital and Analog Comm. System, Leon W. Couch
4. Analog and Digital Comm, H. P. Hsu

EC605 CONTROL SYSTEMS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	CONTROL SYSTEMS ANALYSIS AND COMPONENTS	**Lectures Required:8** Examples and application of open loop and close loop systems. Brief idea of multivariable control system, Brief idea of Z-transform and digital control systems. Differential equations. Determination of transfer function by block diagram reduction technique & signal flow graph method.
II	TIME RESPONSE ANALYSIS OF FIRST ORDER & SECOND ORDER SYSTEMS	**Lectures Required:7** Transient response analysis. Steady state error & error constants. Dynamic error and dynamic error coefficient, Performance Indices.
III	FREQUENCY DOMAIN METHODS	**Lectures Required:7** Bode plot, Design specification in frequency domain and their co-relation with time domain.
IV	STABILITY OF THE SYSTEM	**Lectures Required:7** Absolute stability and relative stability. Routh's stability criterion, Hurwitz criterion. Root locus method of analysis. Polar plots, Nyquist stability criterion. M and N loci, Nicholas charts.
V	STATE VARIABLE ANALYSIS	**Lectures Required:7** Concepts of state, state variable and state model. State models for linear continuous time systems. Brief idea of state variable analysis in discrete time domain. Transfer functions, Solution of state equation. Concepts of controllability & observability.

Total Lectures Required: 36

***Reference Books*:**

1. Control Systems Engineering, I.J. Nagrath, Gopal
2. Modern Control Engineering, D. Roy Chodhary.
3. Control Systems Principles and Design, M. Gopal
4. Problems & Solution of Control Systems Engineering, A.K. Jairath

EC606.1 NEURAL NETWORKS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T- 1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	INTRODUCTION	**Lectures Required:8** Introduction to Neural Networks, Biological basis for NN, Human brain, Models of a Neuron, Directed Graphs, Feedback, Network architectures, Knowledge representation, Artificial intelligence & Neural Networks.
II	LEARNING PROCESSES	**Lectures Required:7** Introduction, Error -Correction learning, Memory -based learning, Hebbian learning, Competitive learning, Boltzmann learning, Learning with a Teacher & without a teacher, learning tasks, Memory, Adaptation.
III	SINGLE LAYER PERCEPTRONS	**Lectures Required:7** Introduction, Least-mean-square algorithm, Learning Curves, Learning rate Annealing Techniques, Perceptron, Perceptron Convergence Theorem.
IV	MULTI LAYER PERCEPTRONS	**Lectures Required:7** Introduction, Back-Propagation Algorithm, XOR Problem, Output representation and Decision rule, Feature Detection, Back-Propagation and Differentiation, Hessian Matrix, Generalization.
V	RADIAL-BASIS FUNCTION NETWORKS & SELF-ORGAN ISING MAPS	**Lectures Required:7** Introduction to Radial basis function networks, Cover's Theorem on the Separability of Patterns, Interpolation Problem, Generalized Radial-Basis function networks, XOR Problem. Self-Organizing map, Summary of SOM Algorithm, Properties of the feature map.

Total Lectures Required: 36

***Reference Books*:**

1. Fundamentals of Neural Networks: Architectures, Algorithms, and Applications, Lauren Fauselt
2. Artificial Neural Network, B. Yegnarayan
3. Neural Networks: Algorithms, Applications, And Programming Techniques, Freeman
4. Neural Networks: A Comprehensive Foundation, Simon Haykin

BEC 606.2 ADVANCED DATA STRUCTURES

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	ADVANCED TREES	**Lectures Required:8** Definitions and operations on weight balanced trees (Huffman trees), 2-3 trees and Red-Black trees. Augmenting Red-Black trees to cynamic 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.
II	MERGEABLE HEAPS	**Lectures Required:7** Mergeable Heap operations, binomial trees, implementing binomial heaps and its operations. 2-3-4- trees and 2-3-4 heaps. Structure and potential function of Fibonacci heap. Implementing Fibonacci Heap.
III	GRAPH THEORY DEFINITIONS	**Lectures Required:7** Definitions of Isomorphism, Components, Circuits, Fundamental Circuits, Cut-sets, Cut-Vertices, Planer and dual graphs, Spanning trees, Kuratovski's two graphs.
IV	GRAPH THEORETIC ALGORETHMS	**Lectures Required:8** Algorithms for connectedness, finding all spanning trees in a weighted graph and planarity testing. Breadth first and depth first search, topological sort, strongly connected components and, articulation point.
V	APPLICATION OF GRAPHS	**Lectures Required:6** Single source shortest path and all pair shortest path algorithms. Min-Cut Max-Flow theorem of network flows, Ford-Fulkerson Max Flow algorithms.

Total Lectures Required: 36

***Reference Books*:**

EC 606.3 OPTIMIZATION TECHNIQUES

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T- 1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	INTRODUCTION	**Lectures Required:8** Historical development, Engineering application of optimization, Formulation of design problems as a mathematical programming problems, Classification of optimization problems.
II	LINEAR PROGRAMMING	**Lectures Required:7** Simplex methods, Revised simplex method, Duality in linear programming, post optimality analysis.
III		**Lectures Required:7** Applications of Linear programming, Transportation and assignment problems.
IV	NON-LINEAR PROGRAMMING	**Lectures Required:8** Unconstrained optimization techniques, Direct search methods, Descent methods, Constrained optimization, Direct and Indirect methods.
V	DYNAMIC PROGRAMMING	**Lectures Required:6** Introduction, multi-decision processes, computational procedure

Total Lectures Required: 36

Reference Books

EC607 DIGITAL COMMUNICATION LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENT

1. (a) To observe sampling of analog signal. Identify & solve the aliasing problem.
   (b) To observe the Transmission of two signals over a single channel using sampling methods.
2. TDM-PAM: Modulation & demodulation.
3. Operation of a PCM encoder & decoder.
4. TDM-PCM: Modulation & demodulation.
5. Observe the performance of a Delta modulation system & to derive from it a delta sigma modulation system.
6. To generate and study the various data formatting schemes (Unipolar,Bi-polar, Manchester,AMI etc.).
7. Generate ASK signals, with and without carrier suppression. Demodulation of these two types of modulated signal.
8. Generate the FSK wave forms & demodulate the FSK signals based on the properties of
   (a) Tuned circuits (b) PLL
9. Generate the PSK signals and demodulate it.

Simulation using Software:

10. To carry out convolution in both continuous *time* and discrete time systems.
11. Companding and multiplexing of PCM signals.
12. Perform various keying Techniques: PSK, ASK, FSK & MSK.

EC 608 ADVANCED MICROPROCESOR LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENT

1. Write a Program for addition of two 16 bit nos.
2. Write a Program for multiplication of two 8 bit nos result 16 bit.
3. Write a Program for division.
4. Write a Program for transfer of block of bytes in same & reverse order.
5. Write a Program to generate feboracci series in hex & in decimal.
6. Write a Program for multibytes addition (in hex and in decimal).
7. Write a Program to find largest no. from array.
8. Write a Program to fine smallest no. form array.
9. Write a Program to find out sum of series of n no.
10. Write a Program to arrange the data array in acceding order & Discarding order.

EC 609 HUMANITIES

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INDIA**	**Lectures Required:** Brief History of Indian Constitution- framing, features, fundamental rights, duties, directive principles of state. History of Indian national movement, Socio economic growth after independence.
II	**SOCIETY**	**Lectures Required:** Social Groups- Concepts and types, socialization- concept and theory, social control; concept, social problem in contemporary India, status and role.
III	**THE FUNDAMENTALS OF ECONOMICS**	**Lectures Required:** Meaning, definition and importance of economics, Logic of choice, Central Economic Problems, Positive and Normative approaches, economic systems socialism and capatalism.
IV	**MICROECONOMICS**	**Lectures Required:** Law of demand and supply, Utility approach, Indifference curves, Elasticity of demand & supply and applications, Consumer surplus, Law of returns to factors and returns to scale.
V	**MACRO ECONOMICS**	**Lectures Required:** Concept relating to national product-National income and its measurement, Simple Keynesian theory, Simple multiplier, Money and banking,- Meaning, Concept of international trade, Determination of exchange rate, Balance of payments. Characteristics of Indian Economy.

EC 610 INDUSTRIAL ELECTRONICS LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 2 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENT

1. Study the characteristics of SCR.
1.1 Observe the terminal configuration.
1.2 Measure the breakdown voltage.
1.3 Measure latching and holding current.
1.4 V-I characteristics.
2 Perform experiment on triggering circuits for SCR.
2.1 R-triggering circuit. 2.2 R-C triggering circuit.
2.3 UJT triggering circuit. 3 Study and obtain the characteristics of Diac.
4 Study and obtain the waveforms for single-phase half-wave controlled converter.
5 Study and obtain the waveforms for single-phase half controlled symmetrical and asymmetrical bridge converters.
6 Study and obtain the waveforms for single-phase fully controlled bridge converter.
7 Study and obtain the waveforms for voltage-commutated chopper.
8 Study and obtain the waveforms for current-commutated chopper.
9 Perform experiment on single phase PWM inverter.
10 Perform experiment on buck, boost and buck-boost regulators.
11 Perform experiment on Motor control – open loop & closed loop.

BEC 701- ANTENNA & WAVE PROPAGATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**ANTENNA FUNDAMENTALS**	**Lectures Required:8** Antenna parameters, Radiation from a current element in free space. Quarter & half wave antenna. Reciprocity theorem. Resonant and non-resonant antenna. Effective length and aperature, gain, beamwidth, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature.
II	**ANTENNAS**	**Lectures Required:7** V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas, UHF and Microwave antennas- Antenna with parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas,
III	**ANTENNA ARRAYS**	**Lectures Required:7** Two element array, N-element linear arrays, Broadside, End fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Effect of ground on antennas, Antenna loading Antenna Measurements - Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements
IV	**RADIO WAVE PROPAGATION-I**	**Lectures Required:7** 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 tropospheric scattering.
V	**RADIO WAVE PROPAGATION-II**	**Lectures Required:7** Various Ionospheric layers. Characteristics of ionosphere and its effects on wave propagation. Critical frequency, Virtual height, skipzone & maximum usable frequency. Multiple hop transmission. Oblique & vertical incidence transmission. Effect of earth's magnetic field, solar activity and meteorological conditions on wave propagation.

Total Lectures Required: 36

***Reference Books*:**

1. Antenna And Wave Propagation, K. D. Prasad
2. Antennas and Wave Propagation, John D Kraus
3. Antennas and Wave Propagation, Balanis
4. Electromagnetic waves and Radiating Systems, Jordan, Balmain

BEC 702 DIGITAL SIGNAL PROCESSING

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**SAMPLING**	**Lectures Required:7** Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.
II	**TRANSFORM ANALYSIS OF LTI SYSTEMS**	**Lectures Required:7** Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations, All-pass system, Minimum-Phase systems, Linear systems with linear phase.
III	**STRUCTURES FOR DISCRETE-TIME SYSTEMS**	**Lectures Required:7** Block diagram and signal flow graph representation of LCCD (LCCD – Linear Constant Coefficient Difference) equations, Basic structures for IIR and FIR systems, Transposed forms.
IV	**FILTER DESIGN TECHNIQUES**	**Lectures Required:7** Introduction, Analog filter Design: Butterworth & Chebyshev. IR filter design by impulse invariance & Bilinear transformation. Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.
V	**DISCRETE FOURIER TRANSFORM**	**Lectures Required:8** The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT. Efficient computation of the DFT: Decimation–in-Time and Decimation-in frequency FFT Algorithms. Processing of speech signals: Vocoders, linear predictive coders.

Total Lectures Required: 36

***Reference Books*:**

1. Digital Signal Processing, S. Salivahanan, A. Vallavaraj
2. Digital Signal Processing, Oppenhim, Schafer
3. Introduction to Digital Signal Processing, Johnny R. Johnson
4. Discrete Time Signal Processing, Oppenhim, Schafer, Buck

BEC 703- WIRELESS COMMUNICATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	PROPAGATION PHENOMENA	**Lectures Required:7** Fundamentals of fading, Multipath channels, Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing.
II	LINE OF SIGHT MICOWAVE COMMUNICATION	**Lectures Required:7** Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Transmitter & Receiver.
III	MULTIPLE ACCESS TECHNIQUES	**Lectures Required:6** FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks. CDMA based networks,
IV	CELLULAR WIRELESS NETWORKS	**Lectures Required:8** GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN's: Technology, IEEE 802.11 standards and Blue tooth. Broadband Wireless 802.16
V	SATELLITE COMMUNICATION	**Lectures Required:8** Elements of satellite communication: Frequency bands, Transmission and multiplexing. Modulation, Multiple access. Satellite orbit and description- orbital period and velocity, effects of orbital inclination, Azimuth and elevation, Coverage angle and slant range, Geostationary orbit, Satellite description. Earth Station antenna, high-power amplifier, low-noise amplifier, up converter, down converter, monitoring and control, reliability. Satellite Link: basic link analysis,

Total Lectures Required: 36

***Reference Books*:**

1. Mobile Communication, Jochen Schiller
2. Principles & Applications of GSM – Vijay K. Garg, and J.E. Wilkes.
3. Principal of Mobile Communications, Rappapart
4. Wireless Communication, Williams Stallin
5. Wireless Communication, Roody

BEC 704-I C TECHNOLOGY

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	INTRODUCTION TO TECHNOLOGIES	**Lectures Required:8** 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.
II	DIFFUSION & ION IMPLANTATION	**Lectures Required:7** Ficks diffusion Equation in One Dimension, Atomic model, Analytic Solution of Ficks Law, correction to simple theory , Diffusion in SiO2. Ion Implantation and Ion Implantation Systems Oxidation. Growth mechanism and Deal-Grove Model of oxidation, Linear and Parabolic Rate co-efficient, Structure of SiO2, Oxidation techniques and system, Oxide properties.
III	CHEMICAL VAPOUR DEPOSITION AND LAYER GROWTH	**Lectures Required:7** 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.
IV	PATTERN TRANSFER-	**Lectures Required:7** Introduction to photo/optical lithography, Contact/ proximity printers, Projection printers, Mask generation, photoresists. Wet etching, Plasma etching, Reaction ion etching.
V	VLSI PROCESS INTEGRATION	**Lectures Required:7** Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI; Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology.

Total Lectures Required: 36

***Reference Books*:**

1. VLSI Technology, S.M. Sze
2. The Science and Engineering of Microelectronic Fabrication, Stephen A. Campbel

BEC705- VLSI DESIGN

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INTRODUCTION TO MOS TECHNOLOGY**	**Lectures Required:7** Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication.
II	**BASIC ELECTRICAL PROPERTIES AND CIRCUIT CONCEPTS**	**Lectures Required:7** 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 COMS inverter (Bn/Bp), MOS transistor circuit model
III	**COMS LOGIC CIRCUITS:**	**Lectures Required:8** The inverter, combinational logic NAND gate, NOR gate, compound gate 2 input CMOS multiplexers, memory latches & registers, transmission gate, gate-delay, CMOS-gate transistor sizing, and power dissipation.
IV	**BASIC PHYSICAL DESIGN:**	**Lectures Required:7** Physical design rules, physical design of simple gates & layout issues. Layout issues for inverter, layout for NAND & NOR gate complex logic gates layout, layout optimization for performance
V	**INTRODUCTION TO VHDL:**	**Lectures Required:7** VHDL Code for simple Logic gates, flip-flops, shift registers.

Total Lectures Required: 36

***Reference Books*:**

1. CMOS Digital Integrated Circuits Analysis & Design, S.M. Kang & Y. Leblibici
2. Solid State Electronic Design, B.G. Streetman & S. Banerjee:
3. Introduction to VLSI, K.Eshraghian & Pucknell
4. VHDL Primer, J. Bhaskar Addison

BEC 706.1 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INTRODUCTION TO AI KNOWLEDGE**	**Lectures Required:8** Importance of AI, Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages.
II	**KNOWLEDGE REPRESENTATION**	**Lectures Required:8** Syntax Semantics, Inference Rules, Non-deductive Inference methods, and representations using rules, forward chaining and backward chaining. Fuzzy Logic & Natural languages computations. Probabilistic Reasoning. Object Oriented Representations.
III	**KNOWLEDGE ORGANIZATION & MANIPULATION-**	**Lectures Required:8** Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.
IV	**KNOWLEDGE SYSTEMS ARCHITECTURE**	**Lectures Required:6** Rule based, non-production, uncertainty knowledge system building tools.
V	**KNOWLEDGE ACQUISITION**	**Lectures Required:6** General concepts, learning by induction.

Total Lectures Required: 36

***Reference Books*:**

1. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson.
2. Introduction to artificial intelligence and expert systems, Rich, Knight

BEC 706.2 SATELLITE COMMUNICATIONS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS**	**Lectures Required:8** Introduction – Frequency Allocations for Satellite Services –Polar Orbiting Satellites –Kepler's First Law – Kepler's Second Law – Kepler's Third Law – Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights – Orbital Perturbations
II	**GEOSTATIONARY ORBIT & SPACE SEGMENT**	**Lectures Required:7** Introduction – Antenna Look Angels – The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage – Launching Orbits – Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem
III	**EARTH SEGMENT & SPACE LINK**	**Lectures Required:8** Transmit-Receive Earth Stations– Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses – Link Power Budget Equation – System Noise – Antenna Noise – Amplifier Noise Temperature – Amplifiers in Cascade – Noise Factor – Noise Temperature of Absorptive Networks – Overall System Noise Temperature – Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output– Combined Uplink and Downlink C/N Ratio – Intermodulation Noise.
IV	**SATELLITE ACCESS**	**Lectures Required:7** Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Code-Division Multiple Access – Direct-Sequence spread spectrum – code signal c(t) – autocorrelation function for c(t) – Acquisition and tracking – Spectrum spreading and dispreading
V	**DIRECT BROADCAST SATELLITE SERVICES**	**Lectures Required:6** Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink -Problems - Satellite Mobile Services – VSATs.

Total Lectures Required: 36

***Reference Books*:**

1. Satellite Communications, Dennis Roddy
2. Satellite Communications, Timothy Pratt – Charles Bostian & Jeremy Allmuti
3. Satellite Communication Systems Engineering, Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson,
1. Modern Satellite Communications, D C Agarwal

EC 706.3- ITC & CRYPTOGRAPHY

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T 1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**INTRODUCTION**	**Lectures Required:6** Elements Of Information Theory: Measure of information, average information, entropy, information rate. Communication channel, discrete and continuous channel
II	**CHANNEL CAPACITY BANDWIDTH**	**Lectures Required:7** Shannon-Hartley theorem and its implications. Channel capacity, Gaussian channel and bandwidth-S/N tradeoff
III	**INTRODUCTION TO CODING**	**Lectures Required:7** Introduction of Coding: types of efforts, types of codes, error control coding, methods of controlling errors
IV	**VARIOUS CODING TECHNIQUES & ANALYSIS**	**Lectures Required:8** Linear Block and Binary Cyclic Codes: matrix decryption of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes, structure of cyclic codes, encoding using an (n-k) bit shift register syndrome calculation, its error detection & correction, special classes of cyclic codes bch
V	**BURST & CONVOLUTION CODES & INTRODUCTION CRYPTOGRAPHY**	**Lectures Required:8** Burst and Convolution Codes: burst and random error correcting codes, encoders for convolution codes. Decoders for convolution codes. Introduction to cryptography, Diff. ways of encryption AES, DES, RSA, ECC. Secret key ciphers, stream ciphers, block ciphers attack & defense. Public key cipher.

Total Lectures Required: 36

***Reference Books*:**

1. ITC & Cryptography, Ranjan Bose
2. Analog And Digital Comm, Schaum Series
3. Digital and Analog Communication Systems, K Sam Shanmugam
4. Analog-Communication, R.P. Singh, S.D. Sapre

EC 707 SIGNAL PROCESSING LAB - II

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

Modeling and simulation using MAT LAB

1. Realising a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input.
2. To simulate the transmitter and receiver for BPSK
3. To design and simulate FIR digital filter (LP/HP).
4. To design and simulate IIR digital filter (LP/HP).
5. To study and simulate effect of circular convolution.

DSP Lab using TMS320C6XXX DSP Kits

6. To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP.
7. To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR).
8. Verification of Sampling Theorem.
9. Verification of linear/circular convolution.
10. To design FIR and FIR digital filter (LP/HP).

EC 708 WIRELESS COMMUNICATION LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

1. Measurement of antenna characteristics : Radiation Pattern on polar plots, Beam width and Gain of main lobe for the following types of antennas.
(a) Half wave and quarter wave dipole
(b) Folded dipole
(c) Yagi UDA multiple element folded dipole
(d) Hertz Antenna
(e) End fire array and broad side array
(f) Helix antenna
(g) Paraboloid reflector antenna
(h) Loop antenna
(i) Ground plane antenna
(j) Log periodic antenna
(k) Rhombus antenna
(l) Slot antenna
2. Demonstration of modeling of wire antenna using appropriate design software.
3. Simulation of antenna arrays using appropriate software.
4. Design and testing of microstrip rectangular patch antenna using appropriate software.
5. Investigate the transmission characteristics of the link and measure the gain of the microstrip patch antennas. Draw the antenna radiation diagram.
6. Radar Trainer: Working of Doppler radar, velocity of moving object, time and frequency measurement and other applications.
7. To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer.
8. To establish analog/digital communication link and transmit & receive three signals (audio, video, tone) simultaneously using Satellite Communication Trainer.
9. To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude

BEC 801 DIGITAL IMAGE PROCESSING

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	BASIC IMAGE PROCESSING	**Lectures Required:7** Fundamentals of digital image processing, image perception, image sensing and acquisition, sampling and quantization, image representation, basic relationship between pixels.
II	IMAGE TRANSFORMATIONS	**Lectures Required:8** Spatial Domain methods: Basic grey level transformation, histogram equalization, image subtraction. Spatial filtering: smoothing, sharpening filters, laplacain filters. Frequency domain filters: smoothing, sharpening filters, homomorphic filtering . Fourier transform, fast Fourier transform short time Fourier transform, cosine transform, discrete wavelet transform.
III	IMAGE SEGMENTATION	**Lectures Required:8** Detection of discontinuities. Edge linking and boundary detection, thresholding, region based segmentation. Representation & description: Representation, boundary descriptor, regional descriptor.
IV	IMAGE COMPRESSION	**Lectures Required:7** Algorithms and standards: Lossless compression: variable length coding, LZW coding, bit plane coding, predictive coding, DPCM. Lossy compression: transform coding, wavelet coding. Basics of image compression standards: JPEG, JPEG2000.
V	MORPHOLOGICAL PROCESSING APPLICATIONS	**Lectures Required:6** Introduction dilation erosion, open and close. Thinning and thickening. Character recognition, biomedical image processing. Watermarking, multi resolution analysis.

Total Lectures Required: 36

***Reference Books*:**

1. Digital Image Processing, R.C. Gonzalez, R.E. Woods
2. Digital Image Processing, W.K. Pratt
3. Image Processing Analysis and Machine Vision, M. Sonka, V. Hlavac, R. Boyle
4. Fundamentals of Digital Image Processing, A.K. Jain

BEC 802- RADAR & TV ENGINEERING

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	RADAR	**Lectures Required: 8** Radar Block diagram, frequencies and applications. Radar range equation. Continuous wave (CW) & FM radar; Moving target indicator (MTI) : Delay line cancellers, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and monopulse radar, Types of display, Radar receivers, Noise figure.
II	NAVIGATIONAL AIDS	**Lectures Required: 8** Principle of operation of Radar direction finder & range system. LORAN system, DME, TACAN, Aircraft landing systems..
III	BASIC OF TV ENGINEERING	**Lectures Required: 6** Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis. T.V Cameras : Image orthicon, plumbicon, vidicon. CCD camera tubes. Types of Monochrome and colour picture tubes, set-up adjustments.
IV	TV ENGINEERING	**Lectures Required: 6.** 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 transmission & reception antennas.
V	TV RECEIVER	**Lectures Required: 8** 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 their diagnosis. Basic idea of HDTV, DBS-TV and 3D-TV. LED TV, LCD and Plasma displays

Total Lectures Required: 36

***Reference Books*:**

1. Television Engineering, R.R.GULATI
2. Antenna and Wave Propagation, K.D. Prashad
3. Introduction to Radar, M.I. Skolnik
4. Basic Television, G.M. Grobe

EC 803-OPTICAL COMMUNICATION

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**OPTICAL FIBERS**	**Lectures Required:8** Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Attenuation, signal distortion in optical fibers, Dispersion-intra modal & inter modal, Dispersion shifted and flattened fiber
II	**OPTICAL SOURCES**	**Lectures Required:7** LED's- Structure, Materials, Characteristics, Modulation, Power & efficiency, Laser Diodes - Basic concept, Hetro Structure, properties and modulation
III	**OPTICAL DETECTORS**	**Lectures Required:7** - PIN and Avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.
IV	**OPTICAL FIBER COMMUNICATION SYSTEMS**	**Lectures Required:8** Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Applications, Wavelength division multiplexing
V	**OPTICAL FIBER MEASUREMENTS**	**Lectures Required:6** Measurements of Fiber attenuation, Dispersion, refractive index profile, Numerical aperture & diameter.

Total Lectures Required: 36

***Reference Books*:**

1. Optical Fiber communication, John Senior
2. Optical Fiber communication, Gerd Keiser
3. Introduction to Optical Fiber, Allien H. Chairin
4. Optical communication, RM Gagliardi & S. Karp

BEC 804.1 VHDL

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T-1 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**MODERN DIGITAL SYSTEMS**	**Lectures Required:8** Modern Digital Systems Complexity & diversity of Digital Systems Productivity Gap. Design flow of ASICs and FPGA
II	**COMBINATIONAL & SEQUENCIAL CIRCUITS**	**Lectures Required:8** VHDL Code for Multiplexer, Decoders, encoders, Code Converters, Combinational Circuits. Flip-Flops, shift registers, Counters.
III	**SYNCHRONOUS SEQUENCIAL CIRCUITS**	**Lectures Required:6** Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine.
IV	**VHDL SUBPROGRAMS AND ATTRIBUTES**	**Lectures Required:7** VHDL Subprograms parameters, overloading, predefined attributes, user defined attributes.
V	**DIGITAL SYSTEM DESIGN**	**Lectures Required:7** Design examples (ASM Charts) of Bit Counting Circuit Divider, Multiplier, Arithmetic Mean Shifting & Sorting Operations. Clock Skew

Total Lectures Required: 36

***Reference Books*:**

1. VHDL Primer, J. Bhaskar
2. Fundamental of Digital Circuits using VHDL, Stephen Brown
3. Programming Example VHDL, Douglas Perry

BEC 804.2- MICROCONTROLLER AND EMBEDDED SYSTEMS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 T **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**8051 Introduction**	Difference between microprocessor & microcontroller. INTEL'S family of 8 bit microcontroller. Architecture of 8051. pin diag. of 8051. register set of 8051. interrupts of 8051. **Lectures Required: 8**
II	**8051 Instruction Set & Programming**	Classification of instructions. Data transfers. Arithmetic external data moves, push and pop instructions. logical instructions Byte level & bit level instructions. Jump and call instructions. Waiting assembly language program. Idea of embedded "C" Addressing modes of 8051 **Lectures Required: 8**
III	**8051 Real Time Control**	Interrupts of 8051, multiple sources of interrupts. Interrupt structure of 8051 timers. TCON & TMOD register. IP register. **Lectures Required: 6**
IV	**Introduction to Embedded System**	Embedded system, categories & requirements of Embedded system., challenges & issues in Embedded software development, applications of Embedded system in consumer electronics, control system, biomedical systems, handheld computers, Embedded system development process tools, SOC Embedded operating systems serial & Parallel I/O interface. **Lectures Required: 8**
V	**Interfacing Chips**	A/D & D/A converters. LED & LCD interfacing. Keyboard interfacing. Werting program for interfacing chips. **Lectures Required: 6**

Total Lectures Required: 36

***Reference Books*:**

1. Microcontroller and Embedded Systems, M. Mazidi
2. Microcontroller. Architecture, Programming, and Applications. Kenneth J. Ayala.

BEC 804.3 COMPUTER NETWORKS

Teaching Hrs. **Exam. Hrs. – 3 Hrs.**
L-3 **Marks Theory Exam -80 Term Test – 20 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I	**QUEUING THEORY**	**Lectures Required:7** Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/□, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula. M/G/1 Queuing model basics.
II	**DATA LINK LAYER**	**Lectures Required:8** Packet & Circuit switching, OSI & TCP/IP Reference Models, Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat, HDLC, Data link layer in internet.
III	**MEDIUM LAYER**	**Lectures Required:7** Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI, IEEE standards 802.2, 802.3 Hubs, Bridges, Routers & Gateways.
IV	**NETWORK LAYER**	**Lectures Required:7** Network layer Design issues. Adaptive & Non-adaptive routing algorithms, Congestion control algorithms for TCP/IP networks, Internetworking, Network layer in the Internet: IPv4 & IPv6 Protocols, OSPF and BGP. TCP Protocol architecture.
V	**ATM NETWORKS**	**Lectures Required:7** Connection Oriented Networks: X.25, Frame Relay & ATM. ISDN system architecture. Broadband ISDN. ATM Protocol architecture, Recognition Algorithm in ATM Networks, Congestion control Algorithms.

Total Lectures Required: 36

***Reference Books*:**

1. Computer Networks, Tanenbaum.
2. Data Networks, Gallager
3. Data & computer Communication, Stallings
4. Probability and Statistics with reliability, Trivedi

BEC 805- DIGITAL IMAGE PROCESSING LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

1. Introduction to MATLAB 7.5 (R2007b)
2. General MATLAB commands used in DIP.
3. To generate the Histogram of gray level image and equalize the Histogram of give image.
4. To implement various "gray level transformation" function for $\gamma < 1, \gamma = 1$ *and* $\gamma > 1.$
5. To implement various interpolation function.
6. Customize display window?
7. Register the given image with reference image.
8. Smooth the gray level image of various size 3×3, 5×5, 7×7.
9. Implement various gradient spatial filter to detect edges in given gray level image and compare the result.
10. Implement various spatial filters to detect Horizontal vertical line at $\pm 45^0$

BEC 806- INDUSTRIAL ECONOMICS AND MANAGEMENT LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 2 **Marks Practical Exam - 40 Sessional – 60 Total 100**

CONTENTS OF SYLLABUS

Unit	Topics	Details of Coverage
I		Organizational forms, Profit maximization and other objectives of industrial firms, Theory of profitability, Economies of scale. Financing of Industries- Need and sources of finance, Role of special financial institutions, Investment criteria-NPV, IRR.
II		Approaches to industrial location analysis, Productivity analysis, Input-Output analysis, Concentration of economic power. New Industrial Policy – Critical analysis, Role of technology and entrepreneurship in industrial development.
III		Management – Principles of management, functions-planning, Organization staffing, Directing, Controlling, Coordination, Decision making.
IV		Production Management – Total quality management, JIT, Quality circle, Quality-ISO9000, ISO14000, KANBAN, Bench marking, Effective communication.
V		Labour Legislations.

BEC 807- VLSI & Optical fiber LAB

Teaching Hrs. **Exam. Hrs. – Practical**
P - 3 **Marks Practical Exam - 40 Sessional – 60 Total 100**

LIST OF EXPERIMENTS

PART-I
Schematic design and make Device Level Layout of following circuits.
1. BJT/FET Amplifier in various configuration..
2. Counters, Shift Registers & Sequence Decoders.
3. Various circuits with Op-Amp.

PART-II
Design of following ckt using appropriate software like VHDL/ FPGA.
4. 3-input NAND gate.
5. Half adder.
6. D-Latch.
7. Serial in-serial out shift register.

PART-III
To perform following experiments based on Fiber Optic Trainer.
8. To set up Fiber Optic Analog link.
9. To set up fiber Optic Digital link.
10. Measurement of Propagation loss and numerical aperture.
11. Characterization of laser diode and light emitting diode.