RAMA UNIVERSITY UTTAR PRADESH, KANPUR

FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS AND EVLUATION SCHEME

[Effective from the Session 2014-15]

B. Tech.

ELECTRONICS AND COMMUNICATION ENGINEERING

2nd, 3rd & 4th Year

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering and Technology
Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech. - Electronics & Communication Engineering

Year-2 SEMESTER-III

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BAS-301	Mathematics III	3	1	0	20	20	60	100	4
2	BEC-301	Electronic Materials and Component	3	1	0	20	20	60	100	4
3	BEC-302	Digital Electronics	3	1	0	20	20	60	100	4
4	BEC-303	Electronic Instrumentation and Measurements	3	1	0	20	20	60	100	4
5	BEC-304	Signals and Systems	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC-351	Electronics Engineering Lab I	0	0	2	30	20	50	100	1
7	BEC-352	Digital Electronics Lab I	0	0	2	30	20	50	100	1
8	BEC-353	Measurement Lab	0	0	2	30	20	50	100	1
9	BEC-354	MAT Lab	0	0	3	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 *Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to 4th year.*

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering and Technology
Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech. - Electronics & Communication Engineering

Year-2 SEMESTER-IV

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEC 011-015	Departmental Elective-I	3	1	0	20	20	60	100	4
2	BEC-401	Semiconductor Devices and Circuits	3	1	0	20	20	60	100	4
3	BEC-402	Computer Architecture & Organization	3	1	0	20	20	60	100	4
4	BEC-406	Electromagnetic Field Theory	3	1	0	20	20	60	100	4
5	BEC-404	Network Analysis	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC-451	Electronics Engineering lab II	0	0	2	30	20	50	100	1
7	BEC-452	Network Lab	0	0	2	30	20	50	100	1
8	BEC-453	Electronics Workshop & PCB LAB	0	0	3	30	20	50	100	1
9	BEC-454	Digital Electronics Lab II	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

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Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

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Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

B. Tech EC 3rd Sem

Mathematics – III (BAS 301)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Transform Methods:** Fourier integral, conditions of convergence, Fourier sine and cosine integrals, complex form, applications, Fourier transform pairs, existence conditions, and operational properties. Applications of Laplace transform and Fourier transform to solve boundary value problems, Discrete and Fast Fourier transforms and its applications. Development of difference equations as models, operator method, method of undetermined coefficients, Z-transform pairs, ROC. Operational properties, limiting- value theorems, its applications to solve difference equations and BVP, systems of difference equations.	**8**
Unit 2	**Functions of a Complex Variable and Conformal Mapping:** Limit, continuity, differentiability and analyticity, Cauchy-Riemann equations, harmonic functions, complex functions as mappings, linear transformation, inverse transformation, bilinear transformation, conformal mapping, and applications.	**8**
Unit 3	**Integration of Complex Functions:** Contour integrals and evaluations, Cauchy-integral theorem, Cauchy's integral formulae, Liouville's theorem, convergence of power series, Taylor series, Laurent series, zeros and singularities of a complex function, residues and residue theorem, evaluation of definite and improper integrals.	**8**
Unit 4	**Curve – Fitting, Correlation, Regression and Probability:** Curve-fitting, method of least- squares , fitting of straight lines, polynomials, non-linear and exponential curves etc., correlation analysis, linear, non-linear and multi-regression analysis, probability, random variables and probability distributions, expectation, moments and transform methods, Binomial, Poisson and Normal distributions, overview of t-distribution, F-distribution and χ^2-distribution.	**8**
Unit 5	**Statistical Methods:** Sampling theory, parameter estimation, confidence intervals, tests of hypotheses and significance; z-, t-, F-, and χ^2 tests, goodness of fit test - χ^2 test, analysis of variance, non-parametric tests (Simple application), time series analysis, index numbers, quality control charts and acceptance sampling, Introduction to design of experiments, Forecasting models.	**10**

Text Books:

1. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.
2. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
3. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons 8th Edition.

B. Tech EC 3rd Sem

Electronic Materials and Component (BEC 301)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Atomic models, Chemical bonding, Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices, Classification of material into conducting, semi conducting and insulating materials through a brief reference to their atomic structures and energy bands.	**8**
Unit 2	**CONDUCTING MATERIALS:** Electronic properties of solids, band theory, Resistivity - factors affecting resistivity, Temperature coefficient of resistance, Thermal conductivity, Properties and applications of copper, aluminum, nickel, silver, tungsten, manganese, tantalum, brass &bronze and resistive alloys, Superconductivity.	**8**
Unit 3	**MAGNETIC MATERIALS:** Introduction of magnetic materials, Classification of magnetic materials, Magnetization curve and magnetic properties, Hysteresis loss and eddy current loss- methods to reduce eddy current losses, Soft and hard magnetic materials, ferromagnetic materials, permeability, B-H curve, magnetic saturation.	**7**
Unit 4	**INSULATING MATERIALS:** Electrical Properties: Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant. **SEMICONDUCTORS:** Semi-conductors and their properties, Electrical properties of silicon and germanium, Intrinsic semiconductors, trivalent and pentavalent impurities, Extrinsic semiconductors, Formation of P and N type semiconductors, P-N junction.	**10**
Unit 5	**ELECTRONIC COMPONENTS:** Resistors, Capacitors, Inductors, Relays, Thermocouple, Printed circuit board and its fabrication, Pizeo electric crystal - Principle & applications.	**6**

Text Book:

1. Electronics Engineering Materials by Rains & Bhatacharya, Khanna Publication House

Reference Books:

2. Electrical Engineering Materials by M.L. Gupta, Khanna Publication House
3. Text book of Applied Electronics R.S. Sedha, S. Chand Publication House

B. Tech EC 3rd Sem

Digital Electronics (BEC 302)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Review of Number systems and Binary codes, Binary arithmetic – addition, subtraction, multiplication and division algorithms. **Boolean Algebra**: Simplification of Boolean functions, minimization techniques, Karnaugh's map method, Quine McCluskey's method, realization of various binary functions using AND, OR, NOT, XOR logic gates.	**8**
Unit 2	**Universal gates**: NAND, NOR, realization of Boolean function using universal gates. Combinational Design: Half and full adder, half and full Subtractor, Series and parallel adder, BCD adders, look ahead carry generator. Decoders, Encoders, multiplexers and demultiplexers. Analysis and design of Combinational Circuits, realization of Various Boolean functions using NAND, NOR gates and multiplexers.	**8**
Unit 3	**Flip Flops**: RS, Clocked RS, T, D, JK, race around problem, Master slave JK, State and Excitation Tables. **Shift registers and counters:** synchronous and asynchronous counters, Binary ripple counter, up/down counter, Johnson and ring counter. Analysis and Design of Sequential Circuits.	**8**
Unit 4	**Semiconductor memories**: Organization and construction of RAM, SRAM, DRAM, RAMBUS ROM, PROM, EPROM, EEPROM, PAL and PLAs etc.	**7**
Unit 5	**Logic families**: Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	**8**

Text Book:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education
2. R. P. Jain, Modern Digital Electronics, 4th Edition Mc Graw Hill Education
3. Switching and Finite Automata Theory by Zvi Kohavi and Niraj K. Jha, Tata Mc Graw Hill

Reference Books:

4. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.
5. Digital circuits and logic design, Samuel C. Lee, PHI

B. Tech EC 3rd Sem

Electronic Instrumentation and Measurements (BEC 303)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Measurement Errors:** Gross error, Systematic error, Absolute error and Relative Error, Accuracy, Precision, Resolution and significant figures, Measurement error combination, basics of statistical analysis. **Construction:** PMMC Instrument, Galvanometer, DC ammeter, DC Voltmeter, Series Ohm Meter, AC Indicating Instrument.	**8**
Unit 2	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, Multi-meter probes Digital voltmeter systems, Digital Multi-meters, Digital Frequency Meter system.	**8**
Unit 3	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.	**8**
Unit 4	**CRO:** CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications. **Instrument calibration:** Comparison method, Digital Multi meters as standard instrument, calibration instrument.	**7**
Unit 5	**Transducers :** Classification of Transducer , Selecting a Transducer, Strain Gages, Displacement Transducer, Temperature Measurement, Interfacing Transducer to Electronic control and Measuring Systems.	**8**

Text Book:

1. Electronics Instrumentation and Measurement By David A. Bell, PHI Publication

Reference Books:

2. Modern Electronics and Measurement Techniques by Albert D. Helfrick and William D. Cooper, Pearson Publication.

B. Tech EC 3rd Sem

Signal and Systems (BEC 304)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction to Signals and Systems:** Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equations.	**8**
Unit 2	**Fourier Series and Fourier Transforms:** The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equations.	**11**
Unit 3	**Time and Frequency Characterization of Signals and Systems:** Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.	**10**
Unit 4	**Sampling and Laplace Transform:** Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transforms, Region of Convergence, Inverse Laplace Transforms, Analysis and Characterization of LTI system, Block diagram representation, unilateral Laplace Transform.	**7**
Unit 5	**Z-Transform:** z- Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.	**5**

Text Books:

1. Alan S. Willsky,Alan V. Oppenheim,S. Hamid Nawab "Signals and Systems" Prentice Hall (India) Latest Edition.
2. Haykin, Simon "Signals and Systems" John Wiley.

Reference Books:

3. Proakis, J.G. and Manolakis, D.G. "Digital Signal Processing: Principles Algorithms and Applications" Pearson Education Prentice Hall (India)
4. Roberts, M.J. and Sharma Govind, "Signals and Systems" Tata McGraw-Hill
5. Ambardar, Ashok "Analog and Digital Signal Processing" Thomson 2nd Ed.
6. Mitra, S.K. "Digital Signal Processing" Tata McGraw-Hill
7. Chen 'Signals & Systems, Oxford University, Press.

LABORATORIES of 3rd Sem

Electronics Engineering Lab I (BEC 351)

L T P **Credits – 1**
0 0 2

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, characteristics in detail. Along with their practical usage in the circuit.

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.

2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.

3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper.

4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.

5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.

6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.

7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.

8. **Applications of Op-amp**- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.

Digital Electronics Lab I (BEC 352)

L T P **Credits – 1**
0 0 2

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Measurement Lab (BEC 353)

L T P **Credits – 1**
0 0 2

1. Study of semiconductor diode voltmeter and it's us as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer
   (a) PT-100 trans **(b)** J- type trans **(c)** K-type trans **(d)** Pressure transducer.
6. Measurement of phase difference and frequency using CRO.
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurement

MAT LAB (BEC354)

L T P **Credits – 1**
0 0 3

1. Study of various commands of MAT Labs.
2. To determine node voltages and branch currents in a resistive network.
3. To obtain transient response and Frequency of a series R-L-C circuit for step voltage input. Square Voltage input and Sinusoidal Voltage input.
4. To plot magnitude, phase and step response of a network function.
5. To determine z, y, g, h and transmission parameters of a two part network.
6. To obtain transient response of output voltage in a single phase half wave rectifier circuit using capacitance filter.
7. To obtain output characteristics of CE NPN transistor.
8. To obtain frequency response of a R-C coupled CE amplifier.
9. To obtain frequency response of an op-Amp integrator circuit.
10. To verify truth tables of NOT, AND or OR gates implemented by NAND gates by plotting their digital input and output signals.

Internal Members:

Signature:	1……..	2……..	3……..
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……..
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

B. Tech EC 4th Sem

Semiconductor Devices and Circuits (BEC 401)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Physics and Properties of Semiconductors:** crystal structure, energy bands, statistics, Fermi level, carrier concentration at thermal equilibrium, carrier transport phenomena, Hall effect, recombination, optical and thermal properties, basic properties for semiconductor operation.	**8**
Unit 2	**Electronic Diodes:** LED, Solar cell, Photo diode, direct and indirect band semiconductors, tunnel Diode, schotkey diode, PIN diode, Varactor Diode.	**8**
Unit 3	**Bipolar transistor:** transistor action and device structure, Ebers-Moll Model, current-voltage characteristics, Biasing, BJT internal capacitance. **MOS Field-Effect Transistor:** MOS action and device structure, threshold voltage, derivation of current-voltage characteristics, Biasing in MOS amplifier circuits, MOSFET internal capacitance.	**9**
Unit 4	**Small Signal Amplifier:** Hybrid -Π model, BJT amplifiers: Common Emitter, Common Collector, Common Base amplifiers, MOSFET amplifiers: Common Drain, Common Source, Common Gate amplifiers.	**7**
Unit 5	**Feedback:** The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator, crystal oscillator.	**9**

Text Books:

1. Millman J. and Halkias .C., " Integrated Electronics ", Tata McGraw-Hill.

Reference Books:

2. Robert L. Boylestad and Louis Nashelsky, 8th edn., PHI, 2002.
3. S. Salivahanan, et.al, "Electronic Devices and Circuits", TMH, 1998
4. Floyd, Electronic Devices, Sixth edition, Pearson Education, 2003
5. I.J. Nagrath, Electronics - Analog and Digital, PHI, 1999

B.Tech EC 4th Semester
Computer Organization and Architecture (BEC-402)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Introduction to Design Methodology**: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	**8**
Unit II	**Processor basics**: CPU organization- Fundamentals , Additional features Data Representation – Basic formats, Fixed point numbers, Floating point numbers. Instruction sets – Formats, Types, Programming considerations.	**8**
Unit III	**Datapath Design**: Fixed point arithmetic – Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	**6**
Unit IV	**Control Design**: basic concepts – introduction, hardwired control, Micro programmed control –introduction, multiplier control unit, cpu control unit, Pipeline control- instruction pipelines, pipeline performance.	**8**
Unit V	**Memory organization**: Multi level memories, Address translation, Memory allocation, Caches – Main features, Address mapping, structure vs performance **System Organisation**: Communication methods- basic concepts, bus control. Introduction to 8085	**10**

Text Book:

Text Book: John P Hayes “Computer Architecture and Organisation” McGraw Hilll 3rd Edition.

Reference Books:

M Morris Mano, “Computer System Architecture” PHI 3rd Edition

B. Tech EC 4th sem

Electromagnetic Field Theory (BEC 403)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**UNITS AND VECTOR ANALYSIS:** Products of vectors, Orthogonal Coordinate Systems, Integrals of vector functions. Vector Analysis; Gradient of a scalar field, Divergence of a vector field. Vector Analysis; Curl of a vector field, Stokes's theorem, Null identities.	**6**
Unit 2	**STATIC ELECTRIC FIELDS:** Postulates of electrostatics, Coulomb's law, Gauss's law and applications, Electric potential, dielectrics, flux, boundary conditions, capacitance, capacitors. Electrostatic energy and forces.	**8**
Unit 3	**SOLUTION OF ELECTROSTATIC PROBLEMS;** Poisson's and Laplace's equations Method of images Boundary value problems in Cartesian coordinates Boundary value problems in Cylindrical coordinates, Boundary value problems in Spherical coordinates.	**8**
Unit 4	**STEADY ELECTRIC CURRENTS;** current density, Ohm's law, Boundary condition for current density, Equation of continuity and Kirchhoff's law, power dissipation.	**7**
Unit 5	**STATIC MAGNETIC FIELDS;** Postulates of Magnetostatics, Vector Magnetic Potential, Biot-Savart Law, Magnetic dipole, Magnetic circuits, and Boundary conditions for magnetostatic fields. Magnetic energy, Magnetic forces and torques.	**10**

Text Books:

1. M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press.

References Books:

2. W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH

B. Tech EC 4th sem

Network Analysis (BEC 404)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co-efficient, tuned circuits, Series & parallel resonance. Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :-Transients in RL, RC & RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network.	**8**
Unit 2	**Network Theorems for AC & DC circuits:** Thevenins & Norton's, Superposition, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.	**8**
Unit 3	**Frequency domain analysis –** Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.	**8**
Unit 4	**Network function & Two port networks:** concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.	**8**
Unit 5	**Filters:** Low pass filters, high pass filters, band pass filters, band reject filters, Gain equalizer and delay equalizers, Butterworth filters, m-derived filters, constant k-filters, design of filters.	**8**

Text Book:

1. Network Analysis , D. Roy Chaudhary, Mc Graw Hill Education
2. Network Analysis, M. E. Volkenburg, PHI

Reference Books:

3. Network Analysis and Synthesis, Franklin F. Kou,Willey Education

LABORATORIES of 4th Sem

Electronics Engineering Lab II (BEC 451)

L T P **Credits – 1**
0 0 2

Objective -To design and implement the circuits to gain knowledge on performance of the circuit and its application.

1. **Applications of Op-amp**- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator
2. **Field Effect Transistors**-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier
4. **Bipolar Transistors**- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency Vs gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.
5. **Two stage Amplifier**. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
6. **Common Collector Configuration-Emitter Follower** (using Darlington pair)-Gain and input impedance measurement of the circuit.
7. **Power Amplifiers**-Push pull amplifier in class B mode of operation –measurement of gain.
8. **Differential Amplifier** –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier
9. **Oscillators** -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator
10. **Simulation of Amplifier** circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Network Laboratory (BEC452)

L T P **Credits – 1**
0 0 2

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.

7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.

8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.

9. Determination of image impedance and characteristic impedance of T and ∏ networks, using O.C. and S.C. tests Write Demo for the following (in Ms-Power point).

10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.

11. Determination of frequency response of a Twin – T notch filter.

12. To determine attenuation characteristics of a low pass / high pass active filters.

Electronic Workshop & PCB Lab (BEC 453)

L T P **Credits – 1**
0 0 3

Objective: To create interest in Hardware Technology.

1. Winding shop: Step down transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply.
3. PCB Lab: (a) Artwork & printing of a simple PCB.
   (b) Etching & drilling of PCB.
4. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
5. Testing of regulated power supply fabricated.
6. Fabricate and test the audio amplifier circuit.

Digital Electronics Lab II (BEC 454)

L T P **Credits – 1**
0 0 2

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors.
7. A L U
8. 8085 Assembly Language Programming.

Departmental Elective-I

1. BEC011 Energy Resources
2. BEC 012 Energy Conversion
3. BEC 013 Product Development
4. BEC 014 Data Structures Using C
5. BEC 015 Information Technology Infrastructure and Its Management

DEPARTMENT ELECTIVE – I

B. Tech EC 4th sem
Energy Resources (BEC 011)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Introduction:** Various non-conventional energy resources-Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	**8**
Unit2	**Solar Thermal Energy:** Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.	**9**
Unit 3	**Geothermal Energy:** Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **Magneto-hydrodynamics (MHD):** Principle of working of MHD Power plant, performance and limitations. **Fuel Cells:** Principle of working of various types of fuel cells and their working, performance and limitation.	**9**
Unit 4	**Thermo-electrical and thermionic Conversions:** Principle of working, performance and limitations. **Wind Energy:** Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics, performance and limitations of energy Conversion systems.	**7**
Unit 5	**Bio-mass:** Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. **Wave and Tidal Wave:** Principle of working, performance and limitations. Waste Recycling Plants.	**7**

Text Books:

1. Non-Conventional Energy Sources /G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Weir, CRC Press (Taylor & Francis)
3. Renewable energy sources and emerging technologies by D.P. Kothari, K.C. Singhal, P.H.I.

Reference Books:

4. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
5. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications,2006.
6. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.

B. Tech EC 4th sem

Energy Conversion (BEC 012)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Principles of Electro-mechanical Energy Conversion -** Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems(defining energy & Co-energy), Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque , Generated emf in machines; torque in machines with cylindrical air gap	**9**
Unit2	**D.C. Machines:-** Construction of DC Machines, Armature winding, Emf and torque equation, Armature Reaction ,Commutation, Inter poles and Compensating Windings, Performance Characteristics of D.C. generators	**8**
Unit 3	**D.C. Machines (Contd.):-** Performance Characteristics of D.C. motors, Starting of D.C. motors ; 3 point and 4 point starters , Speed control of D.C. motors: Field Control , armature control and Voltage Control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test)	**8**
Unit 4	**Single Phase Transformer:** Phasor diagram, efficiency and voltage regulation, all day efficiency. **Testing of Transformers:** O.C. and S.C. tests, Sumpner;s test, polarity test. **Auto Transformer:** Single phase and three phase auto transformers, volt-amp, relation, efficiency, merits & demerits and applications	**7**
Unit 5	**Three Phase Transformers:** Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers, three winding transformers.	**8**

Text Books:

1. I.J. Nagrath & D.P. Kothari," Electrical Machines", Tata McGraw Hill
2. Husain Ashfaq ," Electrical Machines", Dhanpat Rai & Sons
3. A.E. Fitggerald, C. Kingsley and Umans, "Electric Machinery" 6th Edition McGraw Hill, International Student Edition.
4. B.R. Gupta & Vandana Singhal, "Fundamentals of Electrical Machines, New Age International.

Reference Books:

5. Irving L. Kosow, "Electric Machine and Transformers", Prentice Hall of India.
6. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
7. Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" Oxford University Press, 2001.

B. Tech EC 4th sem

Product Development (BEC 013)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Concept of Product, definition and scope. Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts	**8**
Unit 2	Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour. Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.	**9**
Unit 3	Transformations, Brainstorming& Synetics, Morephological techniques. Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria. Economic aspects, Fixed and variable costs, Break-even analysis.	**8**
Unit 4	Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations. Design of display and controls, Man-machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design. Application of Computers in Product development & design	**7**
Unit 5	Existing techniques, such as work-study, SQC etc. for improving method & quality of product. Innovation versus Invention. Technological Forecasting. Use of Standards for Design.	**9**

Text Books / Reference Books:

1. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
2. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
3. C.D. Cain, “Product Design & Decision” Bussiness Books

B. Tech EC 4th sem

Data Structures Using C (BEC 014)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	**7**
Unit 2	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	**10**
Unit 3	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	**8**
Unit 4	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	**7**
Unit 5	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees Hashing: Hash Function, Collision Resolution Strategies Storage Management: Garbage Collection and Compaction.	**9**

Text Books :

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++”, PHI
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication
3. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH

B. Tech EC 4th sem

Information Technology Infrastructure and Its Management(BEC 015)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	**INTRODUCTION**-Information Technology, Computer Hardware, Computer Software, Network and Internet, Computing Resources, IT INFRASTRUCTURE- Design Issues, Requirements, IT System Management Process, Service Management Process, Information System Design, IT Infrastructure Library	**8**
Unit 2	**SERVICE DELIVERY PROCESS-** Service Delivery Process, Service Level Management, Financial Management, Service Management, Capacity Management, Availability Management	**7**
Unit 3	**SERVICE SUPPORT PROCESS**- Service Support Process, Configuration Management, Incident Management, Problem Management, Change Management, Release Management **STORAGE MANAGEMENT-** Backup & Storage, Archive & Retrieve, Disaster Recovery, Space Management, Database & Application Protection, Bare Machine Recovery, Data Retention	**9**
Unit 4	**SECURITY MANAGEMENT**- Security, Computer and internet Security, Physical Security, Identity Management, Access Management. Intrusion Detection, Security Information Management	**8**
Unit 5	**IT ETHICS**- Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes. **EMERGING TRENDS in IT**- Electronics Commerce, Electronic Data Interchange, Mobile Communication Development, Smart Card, Expert Systems	**8**

Text Book/ Reference Books:

1. Phalguni Gupta, Surya Prakash & Umarani Jayaraman, "IT Infrastrucrer and its Management" TMH publication.
2. Mohammad Dadashzadeh,"Information Technology Management in Developing countries", IRM Press.

Internal Members:

Signature:	1……..	2……..	3……..
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……..
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering and Technology
Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech. - Electronics & Communication Engineering

Year 3 SEMESTER -V

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEC 021-025	Departmental Elective-II	3	1	0	20	20	60	100	4
2	BEC 501	Analog Integrated Circuits	3	1	0	20	20	60	100	4
3	BEC 502	Communications System-I	3	1	0	20	20	60	100	4
4	BEC 503	Microprocessors	3	1	0	20	20	60	100	4
5	BEC 504	Control System	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC 551	Analog Integrated circuits Lab	0	0	3	30	20	50	100	1
7	BEC 552	Control System Lab	0	0	2	30	20	50	100	1
8	BEC 553	Communication Lab-I	0	0	2	30	20	50	100	1
9	BEC 554	Microprocessors Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 *Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to 4th year.*

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation,MTE-Mid Term Examination,ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

5. Attendance: 5 Marks
6. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering and Technology
Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech. - Electronics & Communication Engineering

Year 3 SEMESTER-VI

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BHU 601	Engineering Economics & Industrial Management	3	1	0	20	20	60	100	4
2	BEC 601	Communication System-II	3	1	0	20	20	60	100	4
3	BEC 602	Digital Signal Processing	3	1	0	20	20	60	100	4
4	BEC 603	VHDL	3	1	0	20	20	60	100	4
5	BEC 031-035	Departmental Elective-III	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC 651	Communication Lab-II	0	0	2	30	20	50	100	1
7	BEC 652	CAD of Electronics Lab	0	0	2	30	20	50	100	1
8	BEC 653	Digital Signal Processing Lab	0	0	2	30	20	50	100	1
9	BEC 654	VHDL	0	0	3	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 *Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to 4th year.*

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

7. Attendance: 5 Marks
8. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
		Date :	

B. Tech EC 5th sem

Analog Integrated Circuits (BEC 501)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**CIRCUIT CONFIGURATION FOR LINEAR IC :** Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.	**8**
Unit 2	**APPLICATIONS OF OPERATIONAL AMPLIFIERS:** adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector.	**8**
Unit 3	**ANALOG MULTIPLIER AND PLL:** Analog Multiplier using Emitter Coupled Transistor Pair, Gilbert Multiplier cell, Variable trans conductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.	**8**
Unit 4	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS:** Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types, switches for D/A converters, high speed sample-and-hold circuits, A/D Converters, specifications, Flash type, Successive Approximation type, Single Slope type, Dual Slope type, A/D Converter using Voltage-to-Time Conversion, Over-sampling A/D Converters.	**8**
Unit 5	**WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs :** Sine-wave generators, Multi vibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators, IC 723 general purpose regulator, Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fiber optic IC.	**8**

Text Books:

1. Ramakant A. Gaywad, "OP Amp And Linear Integrated Circuit", Prentice Hall
2. D. Roy Chaudhary, "Linear Integrated Circuit", New Age Publication.

B. Tech EC 5th sem

Communication System-I (BEC 502)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**AMPLITUDE MODULATION:** Introduction AM, Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. **Double side band suppressed carrier modulation (DSBSC):** Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves.	**8**
Unit 2	**SINGLE SIDE-BAND MODULATION (SSB):** Quadrature carrier multiplexing, Hilbert transform, properties of Hilbert transform, Single side-band modulation, Frequency-Domain description of SSB wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves. **VESTIGIAL SIDE-BAND MODULATION (VSB):** Frequency – Domain description, Generation of VSB modulated wave, Time - Domain description	**8**
Unit 3	**ANGLE MODULATION:** Basic definitions, narrow band FM, wide band FM, transmission bandwidth of FM and PM waves, Generation of FM and PM waves, Demodulation of FM and PM waves.	**8**
Unit 4	Random Process, Probability density functions, cumulative distribution function, Correlation function, Spectral Density **NOISE:** Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks.	**8**
Unit 5	Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises.	**8**

Text Books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe. TMH, 2007 3rd Edition
2. Principles of Communication Systems - Simon Haykin. JohnWiley, 2nd Edition.

Reference Books:

3. Electronics & Communication System - George Kennedy and Bernard Davis, 4th Edition TMH
4. Communication Systems Second Edition - R.P. Singh, SP Sapre, TMH, 2007
5. Communication Systems - B.P Lathi, BS Publication, 2006.

B. Tech EC 5th sem

Microprocessor (BEC 503)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing	**8**
Unit 2	**Introduction to 8086 microprocessor:** Architecture of 8086 (Pin diagram, Functional block diagram, Register organization Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.	**8**
Unit 3	Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation counter and time delays, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.	**8**
Unit 4	BCD to Binary Conversion , Binary to BCD Conversion , BCD to Seven Segment Code Converter, Binary to ASCII, ASCII to Binary code Conversion, EPROM, EEPROM, PAL and PLAs etc BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.	**9**
Unit 5	8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.	**7**

Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", TMH

Reference Book:

3. Kenneth L. Short, "Microprocessors and programmed Logic", Pearson Education Inc.

B. Tech EC 5th sem

Control System (BEC 504)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	**8**
Unit 2	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions.	**8**
Unit 3	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system	**8**
Unit 4	Stability of Linear Control Systems: Bounded-input bounded-output stability- continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion	**9**
Unit 5	Frequency Domain Analysis: Mr (resonant peak) and ωr (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability, gain margin and phase margin, stability analysis with the Bode plot	**7**

Text Books/ Reference Book:

1. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India,
2. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers
3. William A. Wolovich, "Automatic Control Systems", Oxford University Press.

LABORATORIES of 5th Sem

Analog Integrated Circuits Lab (BEC 551)

L T P **Credits – 1**
0 0 3

Objective:-To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
   - **(a)** Low pass filter of cutoff frequency 1 KHz.
   - **(b)** High pass filter of frequency 12 KHz.
   - **(c)** Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave).
10. Astable and Mono-stable multi vibrator using IC 555.
11. **Measurement of Operational Amplifier Parameters**-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Control Systems Lab (BEC 552)

L T P **Credits – 1**
0 0 2

1. DC SPEED CONTROL SYSTEM
   - **(a)** To study D.C. speed control system on open loop and close loop.
   - **(b)** To study of Transient performance, another time signal is added at the input of control Circuit.
   - **(c)** To study how current breaking eddy is being disturbance rejected by close and open loop.
2. DC MOTOR POSITION CONTROL
   - **(a)** To study of potentiometer displacement constant on D.C. motor position control.

(b) To study of D. C. position control through continuous command.
(c) To study of D.C. position control through step command.
(d) To study of D.C. position control through Dynamic response.

3. AC MOTOR POSITION CONTROL
(a) To study of A.C. motor position control through continuous command.
(b) To study of error detector on A.C. motor position control through step command.
(c) To study of A.C. position control through dynamic response.

4. MAGNETIC AMPLIFIER
(a) To study Input / Output characteristic of a magnetic amplifier in mode **(i)** Saturable Reactor, **(ii)** Self Saturable Reactor

5. SYNCHRO TRANSMITTER / RECEIVER
(a) To study of Synchro Transmitter in term of Position v/s Phase and voltage magnitude with respect to Rotor Voltage Magnitude/Phase.
(b) To study of remote position indication system using Synchro-transmitter/receiver.

6. PID CONTROLLER
(a) To observe open loop performance of building block and calibration of PID Controls.
(b) To study P, PI and PID controller with type 0 system with delay.
(c) To study P, PI and PID controller with type 1 system.

7. LEAD LAG COMPENSATOR
(a) To study the open loop response on compensator.
(b) Close loop transient response.

8. LINEAR SYSTEM SIMULATOR
(a) Open loop response
(i) Error detector with gain, **(ii)** Time constant, **(iii)** Integrator
(b) Close loop system
(i) First order system **(ii)** Second order system **(iii)** Third order system

9. Introduction to MATLAB (Control System Toolbox), Implement at least any two Experiment in MATLAB.
(a) Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
(b) Determine transpose, inverse values of given matrix.
(c) Plot the pole-zero configuration in s-plane for the given transfer function.
(d) Determine the transfer function for given closed loop system in block diagram representation.
(e) Plot unit step response of given transfer function and find peak overshoot, peak time.
(f) Plot unit step response and to find rise time and delay time.
(g) Plot locus of given transfer function, locate closed loop poles for different values of k.
(h) Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.
(i) Plot Bode plot of given transfer function.
(j) Plot bode plot of given transfer function and find gain and phase margins
(k) Plot Nyquist plot for given transfer function and to compare their relative stability
(l) Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

Communication Lab-II (BEC 553)

L T P **Credits – 1**
0 0 2

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
   - **(a)** Using switching method
   - **(b)** By sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.
13. MATLAB Based Practical.

Microprocessor Lab (BEC 554)

L T P **Credits – 1**
0 0 2

Objective:- To create interest in Assembly programming.

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.

8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.

9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.

10. Serial communication between two 8085 through RS-232 C port.

Internal Members:

Signature:	1……..	2……..	3……..
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……..
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
		Date :	

B. Tech EC 6th sem

Communication System-II (BEC 601)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**ANALOG-TO-DIGITAL CONVERSION:** Pulse modulation techniques, Sampling, Time, Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation. Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.	**10**
Unit 2	**DIGITAL MODULATION TECHNIQUES:** Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially, Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK),Duo-binary Encoding.	**9**
Unit 3	**DATA TRANSMISSION:** A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.	**8**
Unit 4	**CELLULAR CONCEPTS – SYSTEM DESIGN FUNDAMENTALS:** Cellular concept, channel reuse, handoff strategies-dynamic resource allocation, interference and system capacity, improving capacity and coverage of cellular systems.	**7**
Unit 5	**SPREAD SPECTRUM MODULATION:** Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.	**10**

Text Book:

1. Principles of Communications By Taub and Schilling, 3rd edition
2. T.S. Rappaport, "Wireless Communications," Pearson Education

Reference Books:

2. John G. Proakis and Masoud Salehi, "Digital Communications", Fifth edition, Mc Graw Hill International edition, 2008.
3. Ian A. Glover and Peter M. Grant, "Digital communications", Second edition, Pearson education, 2008.

B. Tech EC 6th sem

Digital Signal Processing (BEC 602)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**DISCRETE - TIME SIGNALS AND SYSTEMS:** Discrete Time Signals Sequences, Linear Shift Invariant Systems, Stability and Casualty, Linear Constants Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.	**8**
Unit 2	**APPLICATIONS OF Z – TRANSFORMS:** System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects. Multi Rate Signal Processing etc	**8**
Unit 3	**DISCRETE FOURIER TRANSFORM (DFT):** Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences.	**8**
Unit 4	**FAST – FOURIER TRANSFORMS (FFT):** Radix 2 Decimation In Time (DIT) and Decimation In Frequency (DIF), FFT Algorithms, Inverse FFT.	**8**
Unit 5	**DIGITAL FILTER DESIGN TECHNIQUES:** Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique, FIR filter Design, windowing Method	**10**

Text Book:

1. Openhiem, Shafer and Buck, “Discrete Time signal Processing” Printice Hall
2. S. K. Mitra, “Digital Signal Process: A computation based Approch”, TMH
3. Johnny R. Johnson, “Digital Signal Processing”, PHI Learning Pvt Ltd., 2009.

Reference Books:

4. John G Prokias, Dimitris G Manolakis, “Digital Signal Processing”, Pearson Education.

B. Tech EC 6th sem

VHDL (BEC 603)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	**7**
Unit 2	**Digital System Design Automation–** Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	**8**
Unit 3	Concurrent Constructs for RT level Descriptions, Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	**7**
Unit 4	**VHDL Signal Model:** Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution	**7**
Unit 5	**Hardware Cores and Models -** Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	**7**

Text Book:

1. Charles H Roth Jr, “Digital System Design using VHDL”, Thomson Learning, 2002.

Reference Books:

2. Stephen Brown & Zvonko Vranesic, “Fundamentals of digital logic design with VHDL”, TMH, 2nd Ed., 2007.
3. Jhon F Wakerly, “Digital design”, PHI, 4th Ed.
4. Volnei A. Pedroni, “Circuit Design with VHDL” PHI Learning

LABORATORIES of 6th Sem

Digital Communication Lab (BEC 651)

L T P **Credits – 1**
0 0 2

Objective:-To design and implement the circuits to gain knowledge of communication system.

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator.
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line.

CAD of Electronics Lab (BEC-652)

L T P **Credits – 1**
0 0 2

Objective:-To design and implement the circuits to gain knowledge on performance of the circuit and its application.

PSPICE Experiments:

1. **(a)** Transient Analysis of BJT inverter using step input.

   (b) DC Analysis (VTC) of BJT inverter with and without parameters.

2. **(a)** Transient Analysis of NMOS inverter using step input.

   (b) Transient Analysis of NMOS inverter using pulse input.

(c) DC Analysis (VTC) of NMOS inverter with and without parameters.

3. **(a)** Analysis of CMOS inverter using step input.

   (b) Transient Analysis of CMOS inverter using step input with parameters.

   (c) Transient Analysis of CMOS inverter using pulse input.

   (d) Transient Analysis of CMOS inverter using pulse input with parameters.

   (e) DC Analysis (VTC) of CMOS inverter with and without parameters.

4. Transient & DC Analysis of NOR Gate inverter.

5. Transient & DC Analysis of NAND Gate.

Digital Signal Processing Lab (BEC 653)

L T P **Credits – 1**
0 0 2

Objective:-To design and implement the circuits to gain knowledge of Signal Processing.

1. With the help of Fourier series, make a square wave from sine wave and cosine waves. Find out coefficient values.

2. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.

3. Implement the FIR Filters for 2 KHz cutoff frequency and 2 KHz bandwidth for band pass filter.

4. Design FIR filter using Fourier series expansion method.

5. Implement IIR low pass filter for a 4 KHz cutoff frequency and compare it the FIR filter with the same type use chirp as input signal.

6. Verify Blackman and Hamming windowing techniques for square wave as an input which window will give good results.

7. Implement the filter functions.

8. Generate DTMF sequence 1234567890*# and observe its spectrogram.

9. Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones.

10. Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones.

11. Generate an FSK wave form for transmitting the digital data of the given bit sequence. Predict and verify the FFT for the same one.

12. To study the circular convolution.

VHDL Lab (BEC 654)

L T P **Credits –1**
0 0 3

Objective: design and implement the circuits by using VHDL tool

1. Write VHDL code for realize all logic gates
2. Write VHDL code for realize for 2x4 decoder.
3. Write VHDL code for realize for 8 to 3 encoder.
4. Write VHDL code for realize for 8:1 Multiplexer.
5. Write VHDL code for realize for comparator circuit.
6. Write VHDL code for realize for Half adder.
7. Write VHDL code for realize for full adder.
8. Write VHDL code for realize for flip flop.

Departmental Elective-II:

1. BEC 021 Antenna & Wave Propagation
2. BEC 022 Introduction to Microcontroller
3. BEC 023 Digital Integrated circuit
4. BEC 024 Laser systems and Applications
5. BEC 025 Compound Semiconductor

Departmental Elective-III:

1. BEC 031 Advance Semiconductor Material & Devices
2. BEC 032 Power Electronics
3. BEC 033 Soft computing
4. BEC 034 Microwave System
5. BEC 035 Automation and Robotics

DEPARTMENT ELECTIVE – II

B. Tech EC 5th sem

Antennas & Wave Propagation (BEC 021)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Antenna Basics:** Introduction. Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity. Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures. Effective Height. Antenna Temperature. Front - to-back Ratio. Antenna Theorems. Radiation- Basic Maxwell's Equations, Retarded Potentials -Helmholtz Theorem	**9**
Unit 2	**Thin Linear Wire Antennas:** Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole - Current Distributions. Field Components. Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole.	**9**
Unit 3	**Antenna Arrays:** Point Sources , Definition. Patterns, arrays of 2 Isotropic Sources, Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays , Broadside Arrays. End fire Arrays.	**6**
Unit 4	**VHF, UHF and Microwave Antennas - I :** Arrays with Parasitic Elements. Yagi-Uda Array. Folded Dipoles and their Characteristics. Helical Antennas - Helical Geometry, Helix Modes, Practical Design Considerations for Helical Antenna Horn Antennas	**7**
Unit 5	**Wave Propagation - I:** Introduction, Definitions, Ground Wave Propagation, Plane Earth Reflections, Space and Surface Waves, Curved Earth Reflections. Space Wave Propagation - I Fading and Path Loss **Wave Propagation - II:** Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path. Critical Frequency, MUF. LET. OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance. Multi-hop Propagation.	**10**

Text Books:

1. Antennas and Wave Propagation - J.D. Kraus, RJ. Marhefka and Ahmad
2. Electromagnetic Waves and Radiating Systems - E.C. Jordan and K.G. Bahrain. PHI, 2nd e d., 2000

Reference Books:

3. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed.. 2005.
4. Antennas and Wave Propagation- K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

B. Tech EC 5th sem

Introduction to Microcontroller (BEC 022)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**8051 Microcontrollers:** Microcontrollers and embedded processors, Overview of the 8051 family **8051 Assembly Language Programming:** Architecture of 8051, Introduction to 8051 assembly programming, Assembling and running an 8051 program, The program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack. **Jump, Loop, And Call Instructions:** Loop and jump instructions, Call instructions time delay for various 8051 chips.	**8**
Unit 2	**I/O Port Programming:** 8051 I/O programming, I/O bit manipulation programming. **8051 Addressing Modes:** Immediate and register addressing modes, Accessing memory using various addressing modes, Bit addresses for I/O and RAM, Extra 128-byte on-chip RAM in 8052. **Arithmetic and Logic Instructions and Programs:** Arithmetic instructions, Signed number concepts and arithmetic operations, Logic and compare instructions, rotate instruction and data serialization, BCD, ASCII, and other application programs.	**8**
Unit 3	**8051 Programming in C:** Data types and time delay in 8051 C, I/O programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Data serialization using 8051 C. **8051 Hardware Connection and Intel Hex File:** Pin description of the 8051, Design and test of 8051 Minimum Module, Explaining the Intel hex files.	**8**
Unit 4	**8051 Timer Programming in Assembly and C:** Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C. **8051 Serial Port Programming in Assembly and C:** Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in Assembly, Programming the second serial port, Serial port programming in C. **Interrupts Programming in Assembly and C:** 8051 interrupts programming, Timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in the 8051/52, Interrupt programming in C.	**8**
Unit 5	**LCD and Keyboard Interfacing:** LCD interfacing, Keyboard interfacing. **ADC, DAC, and Sensor Interfacing:** Parallel and serial ADC, DAC interfacing, Sensor interfacing and signal conditioning. **8051 Interfacing to External Memory:** Semiconductor memory, Memory address decoding, 8031/51 interfacing with external ROM, Flash RAM, 8051 data memory space, Accessing external data memory in 8051 C. RTC Interfacing and Programming, Motor Control: Relay, PWM, DC and Stepper Motors	**8**

Text/ Reference Books:

1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
2. Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw- Hill@2005.

Digital Integrated Circuits (BEC 023)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**MOS Inverter:** Introduction to resistive – load inverter, inverter with n-type MOSFET load, CMOS inverter Switching Characteristics and Interconnects Effects: Introduction, Delay time definitions, Calculation of delay times, Inverter design with delay constraints	**9**
Unit2	**Sequential MOS Logic Circuits:** Introduction, SR latch circuits, Clocked latch and Flip-flop circuits, CMOS D-latch and edge - triggered flip-flop.	**8**
Unit 3	**Semiconductor Memories:** Introduction, Dynamic random access memory (DRAM), Static Random Access Memory (SRAM), Non-volatile memory.	**7**
Unit 4	**Low Power CMOS Logic Circuits:** Introduction, Overview of power consumption, Switching power dissipation CMOS inverter, Estimation and optimization of switching activity.	**8**
Unit 5	**MEMORY ORGANIZATION:** Random Access Memories, Serial Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.	**8**

Text Books:

1. Sang-Mo-Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuit: Analysis and Design", TMH, 3rd ed.
2. Digital circuits and logic design, Samuel C. Lee, PHI
3. R. P. Jain, Modern Digital Electronics, 4th Edition Mc Graw Hill Education
4. Switching and Finite Automata Theory by Zvi Kohavi and Niraj K. Jha, Tata Mc Graw Hill

Reference Books:

5. Eugene D. Fabricius, "Introduction to VLSI Design", McGraw Hill International Editions
6. N. Weste and K. Eshranghian, Principles of CMOS VLSI Design, Addison Wesley
7. L. Glaser and D. Dobberpuhl, The Design and Analysis of VLSI Circuits, Addison Wesley
8. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley
9. J. P. Uyemura, Circuit Design for CMS BLSI, Kluwer
10. R. A. Geiger, P.E. Allen, N.R. Strader, VLSI Design Techniques for Anlog and Digital Circuits, McGraw Hill

LASER systems and Applications (BEC 024)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	Introduction: Review of elementary quantum physics, Schrodinger equation, concept of coherence, absorption, spontaneous emission and stimulated emission processes,	**8**
Unit II	relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities	**8**
Unit III	Lasers & Laser Systems: Main components of Laser, principle of Laser action, introduction to general lasers and their types.	**8**
Unit IV	Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.	**8**
Unit V	Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography	**8**

Text/Reference Books:

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International .
2. S. A. Ahmad, "Laser concepts and Applications" New Age International.

B. Tech EC 5th sem

Compound Semiconductors (BEC 025)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Structure, bonding and ionicity of compound semiconductors, binary and ternary alloy systems; phase diagrams - Ga-As, InP, CdTe, and HgCdTe systems; stoichiometry and composition of IIIV and II-V compounds, Charge transport, lattice modes and scattering processes, ionized impurity, acoustic, piezoelectric and polar optical scattering, quantum effects - 2 dimensional transport	**9**
Unit 2	quantum hall effect, super lattices, resonant tunneling, transport in presence of magnetic fields, Gunn effect, impact ionization and avalanche breakdown, Optical absorption and emission, band structure, dependence on temperature, pressure, composition and degeneracy, impurity and free carrier absorption.	**9**
Unit 3	electrons at heterojunctions, electrons in nanostructures, electrons in coupled nanostructures, photons	**7**
Unit 4	substrates and epitaxy, thin films, device processing, electronics, in-plane optoelectronics, out-of-plane optoelectronics	**7**
Unit 5	magneto-optical effects, luminescence, heterojunctions and interfaces, growth and process induced defects, deep levels, persistent photoconductivity, Applications of compound semiconductors as sensors and actuators.	**8**

Text Books:

1. World of Compound semiconductor.

DEPARTMENT ELECTIVE – III

B. Tech EC 6th sem

Advance Semiconductor Material & Devices (BEC 031)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Physics and Properties of Semiconductors: crystal structure, energy bands, statistics, Fermi level, carrier concentration at thermal equilibrium, carrier transport phenomena, Hall effect, recombination, optical and thermal properties, basic properties for semiconductor operation.	**8**
Unit 2	p-n Junction: depletion region, diffusion, generation-recombination, current-voltage characteristics, junction breakdown, charge storage and transient behavior. optoelectronic devices: LED, Solar cell, Photo diode, direct and indirect band semiconductors	**8**
Unit 3	Bipolar transistor: transistor action and device structure, Ebers-Moll Model, current-voltage characteristics, Biasing, BJT internal capacitance	**8**
Unit 4	MOS Field-Effect Transistor: MOS action and device structure, threshold voltage, derivation of current-voltage characteristics, Biasing in MOS amplifier circuits, MOSFET internal capacitance	**8**
Unit 5	Semiconductor microwave devices and circuits: Microwave transistors and integrated circuits, varactor diodes, tunnel diode and its applications, Gunn diode and its applications IMPATT diode, TRAPATT diode, PIN diode, schottky barrier diodes.	**8**

Text Book:

1. Millman J. and Halkias .C., " Integrated Electronics ", Tata McGraw-Hill.

Reference Books:

2. Robert L. Boylestad and Louis Nashelsky, 8th edn., PHI.
3. S. Salivahanan, et.al, "Electronic Devices and Circuits", TMH,
4. Floyd, Electronic Devices, Sixth edition, Pearson Education
5. I.J. Nagrath, Electronics - Analog and Digital, PHI,

B. Tech EC 6th sem

Power Electronics (BEC 032)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**POWER SEMI-CONDUCTOR DEVICES:** Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC,BJT, IGBT, MOSFET,- Turn-on and turn-off characteristics, switching losses, Commutation circuits for SCR	**9**
Unit2	**PHASE CONTROLLED CONVERTERS:** 2-pulse, 3-pulse and 6-pulse converters, Effect of source inductance, performance parameters, Reactive power control of converters, Dual converters, Battery charger	**8**
Unit 3	**DC TO DC CONVERTER:** Step-down and step-up chopper, Time ratio control and current limit control, Buck, boost, buck- boost converter, concept of Resonant switching - SMPS.	**9**
Unit 4	**INVERTERS:** Single phase and three phase (both 1200 mode and 1800 mode) inverters **PWM Techniques:** Sinusoidal PWM, modified sinusoidal PWM, Multiple PWM, Introduction to space vector modulations, Voltage and harmonic control, Series resonant inverter, Current source inverter.	**8**
Unit 5	**AC TO AC CONVERTERS:** Single phase AC voltage controllers, Multistage sequence control, single and three phase cyclo-converters, Introduction to Integral cycle control, Power factor control and Matrix converters.	**8**

Text Books:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, PHI Third edition, New Delhi 2004.
2. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

Reference Books:

3. Ashfaq Ahmed Power Electronics for Technology Pearson Education, Indian reprint, 2003.
4. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition 2003.
5. Ned Mohan, Tore.M.Undeland, William.P.Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.

B. Tech EC 6th sem

Soft Computing (BEC 033)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent Networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	**9**
Unit 2	Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications.	**9**
Unit 3	Fuzzy Logic-I (Introduction) Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	**7**
Unit 4	Fuzzy Logic –II (Fuzzy Membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.	**7**
Unit 5	Genetic Algorithm(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	**8**

Text Books:

1. B. Yegnanarayana, “Artificial Neural Networks”, PHI
2. James A Freeman, David M Skapura, “Neural Networks-Algorithm s, Applications and Programming Techniques,” Person Education
3. S. N. Sivanandam, S. Sumathi, S. N. Deepa, “Introduction to Neural Networks Using MATLAB 6.0” TMH Publication.
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India

B. Tech EC 6th sem

Microwave System (BEC 034)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction to microwaves and applications, advantages of microwaves, EM spectrum domain, electric and magnetic fields static electric and magnetic fields, time varying electric and magnetic fields, electromagnetic field equations, maxwell's equations for time-varying fields, meaning of maxwell's equations, characteristics of free space, power flow by microwaves, expression for propagation constant of a microwave in conductive medium, microwave applications, relation between dB, dBm, dBw.	**8**
Unit 2	Microwave Tubes: Limitation of conventional tubes, microwave tubes, velocity modulation, method of producing the velocity modulation, principle of operation of two cavity klystron, reflex klystron principle of operation, velocity modulation in reflex klystron, Applegate diagram with gap voltage for a reflex klystron. Principle of operation of magnetron, hull cutoff condition, advantages of slow wave devices, principle of operation of TWT.	**8**
Unit 3	Microwave Semiconductor Devices: Microwave bipolar transistor, FET, Principle of Operation and application of tunnel diode, Principle of operation of gunn diode, application of gunn diode advantages of gunn diode, principle of operation of PIN diode, applications of PIN diode.	**7**
Unit 4	Scattering Matrix Parameters of microwave networks Definition of scattering matrix, characteristics of S-matrix, scattering matrix of a two-port network, salient features of S-matrix, salient features of multiport network, losses in microwave circuits, return loss, insertion n loss, transmission loss, reflection loss, impedance matrix, short circuit admittance parameters of a π -network, S-matrix of series element in the transmission line, S-matrix for E-plane Tee junction, S-matrix for H-plane Tee junctions, S-matrix for directional coupler.	**9**
Unit 5	Microwave Passive components rectangular waveguides resonator isolator, types of attenuators, fixed attenuators, step attenuators, variable attenuators, salient features of directional coupler, parameters of directional coupler, coupling factor, directivity, applications of directional coupler. Microwave Integrated Circuits Salient features of MICs, types of electronic circuits, monolithic microwave integrated circuits (MMICs), Microwave measurements, Measurement of VSWR, attenuation and frequency.	**8**

Text Books:

1. Gottapu Sasi Bhushana Rao, "Microwave and Radar Engineering" Pearson Education, 2013.
2. Prof. GSN Raju "Microwave Engineering", IK International Publishers, 2007

References Books:

3. P.A. Rizzi, "Microwave Engineering", PHI, 1999.

B. Tech EC 6th sem

Automation and Robotics (BEC-035)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction:** Definition, Classification of Robots, geometric classification and control classification. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.	**9**
Unit 2	**Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world. Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.	**9**
Unit 3	**Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Servo system for robot control, and introduction to robot vision.	**8**
Unit 4	**Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.	**7**
Unit 5	**Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.	**7**

Text Books/ References Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill
4. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill
5. Asfahl, "Robots & Manufacturing Automation" Wily Eastern

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering and Technology
Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech. - Electronics & Communication Engineering

Year 4 SEMESTER-VII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEC 701	Data Communication Networks	3	1	0	20	20	60	100	4
2	BEC 702	Wireless and mobile communication	3	1	0	20	20	60	100	4
3	BEC 703	VLSI Design	3	1	0	20	20	60	100	4
4	BEC 041-045	Departmental Elective-IV	3	1	0	20	20	60	100	4
5		Open Elective	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC-751	Microwave and Optical Communication	0	0	2	30	20	50	100	1
7	BEC-752	Mini Project	0	0	3	30	20	50	100	1
8	BEC-753	Seminar	0	0	2	30	20	50	100	1
9	BEC-754	Industrial Training Viva-Voce	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 *Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to 4th year.*

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

9. Attendance: 5 Marks
10. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme
(Effective from the Session 2014-15)
B. Tech.
Electronics & Communication Engineering

Year 4 SEMESTER-VIII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEC 051-055	Departmental Elective-V	3	1	0	20	20	60	100	4
2	BEC 061-65	Departmental Elective-VI	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
3	BEC-851	Major Project	0	0	21	300	---	400	700	16
		Total	**6**	**2**	**21**	**340**	**40**	**520**	**900**	**24**

BHU-001 *Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to 4th year.*

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

Course without practical components

For Continuous Evaluation (CE) is such as: 20 Marks
1 Attendance: 5 Marks
2 Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 300 Marks
Major Project/Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

B. Tech EC 7th sem

Data Communication & Networking (BEC 701)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction to Data Communication and Networks**: Data Communication, Networks, Physical structures; Different topologies, Categories of Networks: LAN, MAN, WAN, Interconnection of networks, The Internet, Protocols and Standards, Standards Organizations. Network Models, Layered tasks, The OSI model, different layers in OSI model. TCP/IP protocol suite ; Line Coding Scheme	**7**
Unit 2	**Physical Layer:** Multiplexing, Frequency Division, Wavelength Division, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks, Structure of a switch, Ethernet Physical Layer,, HDLC, Point to Point Protocol.	**7**
Unit 3	**Data Link Layer**: Introduction Types of Errors, Redundancy, Detection Vs Correction, Forward Error Correction Vs Retransmission, Block Coding Error Detection, Error Correction, Hamming Distance, And Minimum Hamming Distance. Linear Block Codes, Cyclic Codes Cyclic Redundancy Check, Cyclic Code Analysis, Advantages. Checksum, Framing Fixed and Variable Size. Flow and Error Control, Protocols, Noiseless Channels, Simplest and Stop and Wait Protocols. Noisy Channels – Stop and Wait Automatic Repeat Request, Go Back N Automatic Repeat Request, Selective Repeat Automatic Repeat Request. HDLC, Point to Point Protocol.	**9**
Unit 4	**Medium Access**: Random Access ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA). Controlled Access Reservation, Polling, Token Passing. Channelization Frequency Division, Multiple Access (FDMA), Time Division, Multiple Access (TDMA), Code Division Multiple Access (CDMA). IEEE Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet, IEEE 802.11Architecture, MAC Sub layer, Addressing Mechanism, Physical Layer. Bluetooth Architecture, Radio Layer, Baseband Layer, L2CAP.	**8**
Unit 5	**Connecting LANs**: Connecting Devices Passive Hubs, Repeaters, Active Hubs, Bridges, Two Layer Switches, Three Layer Switches, Gateway. Network layer logical addressing. IPv4 Addresses: Address Space, Notation, Classful Addressing, Classless Addressing IPv6 Addresses: Structure and Address Space. Internetworking Need For Network Layer, IPv4Datagram, Fragmentation, Routing Delivery forwarding techniques and processes, routing table, Unicast routing, Multicast routing :Transport Layer Protocol : UDP and TCP, ATM, Cryptography, Network Security	**8**

Text Book:

1. B. A. Forouzan, “Data Communications and Networking”, MGH, 4th ed. 2007

Reference Books:

2. A. S. Tanenbaum, “Computer Networks”, PHI.
3. W. Stallings, “Data and Computer Communication”, PHI.

B. Tech EC 7th sem

Wireless and Mobile Communication Systems (BEC-702)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**GSM** standardization-architecture and function partitioning-GSM radio aspects-security aspects-protocol model-call flow sequences-evolution to 2.5G mobile radio networks. IS-95 service and radio aspects, key features of IS-95 CDMA systems- ECWDMA-UMTS physical layer-UMTS network architecture-CDMA 2000 physical layer.	**9**
Unit 2	**RADIO WAVE PROPAGATION:** Free space propagation model- basic propagation mechanisms –reflection- ground reflection model diffraction-scattering-practical link budget design-outdoor and indoor propagation models. **SMALL SCALE FADING AND MULTIPATH:** Small scale multipath propagation-Impulse response model of a mulitpath channel, small scale multipath measurements-parameters of mobile multipath channels, Types of small scale fading.	**8**
Unit 3	**CAPACITY OF WIRELESS CHANNELS:** Capacity of Flat Fading Channel, Channel Distribution Information known, Channel Side Information at Receiver ,Channel Side Information at Transmitter and Receiver , Capacity with Receiver diversity , Capacity comparisons ,Capacity of Frequency Selective Fading channels. **PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS:** Error probability of BPSK, FSK, MSK, GMSK, QPSK, M-ary PSK, M-ary QAM and M-ary FSK on AWGN channels- Fading– Outage Probability– Average Probability of Error Combined Outage and Average Error Probability.	**8**
Unit 4	**DIVERSITY :** Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combining – Maximal-Ratio Combining – Equal - Gain Combining ,Transmitter Diversity , Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme-basic concepts of RAKE receivers.	**8**
Unit 5	**MULTIPLE ACCESS TECHNIQUES:** Frequency division multiple access-time division multiple access-spread spectrum multiples access space division multiple access- packet radio. **MIMO AND MULTICARRIER MODULATION:** Narrowband MIMO model-parallel decomposition of MIMO channel-MIMO channel capacity-MIMO diversity gain ,data transmission using multiple carriers, multicarrier modulation with overlapping sub channels-mitigation of subcarrier fading-basic concepts of OFDM.	**8**

Text Books:

1. Andrea Goldsmith, “Wireless Communications,” Cambridge University Press, 2005
2. T.S. Rappaport, “Wireless Communications,” Pearson Education, 2003

References:

3. William C.Y. Lee, “Wireless and Cellular Telecommunications,” Third edition, Mc. Graw Hill, 2006.

B. Tech EC 7th sem

VLSI Design (BEC 703)

L T P **Credits – 4**

3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction to VLSI design:** MOS Physics, Structure and operation of MOSFETs, MOSFET Modeling, MOSFET Scaling, MOSFET Capacitances. Basics of Different fabrication Processes of MOS Integrated circuits, Processing Steps,	**8**
Unit 2	**MOS Inverters:** Design and Analysis of different MOS Inverters, CMOS logic structures: The Complementary CMOS Inverter-DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, The Tri State Inverter.	**8**
Unit 3	**CMOS Circuit And Logic Design:** Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, and complex logic circuits. **Sequential MOS Logic Circuits:** Introduction, behavior bi-stable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF Design Rules, Integrated Circuits Layout.	**9**
Unit 4	**Low – Power CMOS Logic Circuits:** Introduction, Overview of Power Consumption, Low Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits	**9**
Unit 5	**Design for Testability:** Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	**6**

Text Books:

1. Sang-Mo-Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuit: Analysis and Design", TMH, 3rd ed.
2. Douglas A. Pucknell, Kamaran Eshraghian "Basic VLSI Design", Prentice Hall of India Publication

Reference Books:

3. Eugene D. Fabricius, "Introduction to VLSI Design", McGraw Hill International Editions
4. N. Weste and K. Eshranghian, Principles of CMOS VLSI Design, Addison Wesley
5. L. Glaser and D. Dobberpuhl, The Design and Analysis of VLSI Circuits, Addison Wesley
6. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley
7. J. P. Uyemura, Circuit Design for CMS BLSI, Kluwer
8. R. A. Geiger, P. E. Allen, N. R. Strader, VLSI Design Techniques for Anlog and Digital Circuits, McGraw Hill

LABORATORIES of 7th Sem

Microwave and Optical Communication Lab (BEC 751)

L T P **Credits – 1**
0 0 2

Part – A:

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
9. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

Part – B:

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study of framing in time division multiplexing.
5. Study and perform time division multiplexing (digital).
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

Mini Project (BEC 752)

L T P **Credits – 1**
0 0 2

Students have to perform a mini project work related to their respective stream in B. Tech. The project work may be software or hardware based. /it may be extendable to major project. Semester.

Seminar (BEC 753)

L T P **Credits – 1**
0 0 2

Students have to give multiple presentations on research & recent technologies with respect to his/her course.

Industrial Training & Viva-voce (BEC 754)

L T P **Credits – 1**
0 0 2

Students have to undergo six to eight week industrial training at end of sixth semester.

Departmental Elective –IV

B. Tech EC 7th sem

Information Security (BEC 041)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Information Security:** Attacks on information, components of Information Security, Cryptographic techniques, public & private key, mathematical tools of cryptography, Cryptography techniques, Authentication access control, Digital signature, Certificates & standards.	**8**
Unit 2	**Cypher Algorithm:** Design principles of block ciphers & Block Cipher Algorithms, Electronic mail security, RSA algorithm, MD5, IDEA, RC2, RC5 algorithm, Stenography techniques.	**8**
Unit 3	**Web Security:** SSL protocol security, HTTPS, WTLS protocol in WAP, Introduction to Web based bio AuC, issues of s/w piracy & copyright, Introduction to IT act 2000.	**8**
Unit 4	**Mobile Attacks:** 3 GPP security, Mobile Virtual Private n/w, Smart Card security, RFID security, Mobile Agent security, Mobile virus, mobile worms	**8**
Unit 5	**Database Security Systems:** Network security concept, Trojans, Intrusion detection, Firewall, Cyber law related to E-commerce.	**8**

Reference Books:

1. Stallings, William- "Cryptography & Network Security: principle and Practices" Pearson Education
2. Asoke K Talukder, Hasan Ahamad, Roopa R Yavagal " Mobile Computing" TMH Publication

B. Tech EC 7th sem

Biomedical Instrumentation (BEC 042)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction to instrumentation, Biomedical Instrumentation, classification of Biomedical Instruments, Justification of biomedical instrumentation, Scope for Biomedical Engineers. Introduction to Human Body, Anatomy, Physiology, Electrophysiology, Electrode system.	**10**
Unit 2	Basic Principal, Construction Classification, operation, testing, design, problems analysis, research, manufacturers, safety, application, artifacts costing, electronics, software, hardware etc of: i. BP Apparatus ii. Audiometers iii. EEG iv. X-ray v. Dialyzer vi. Pacemaker vii. Defibrillator viii. Phonocardiograph ix. Spiro meter x. Blood Analysis Instruments	**9**
Unit 3	Electrical properties of tissues, Shock Analysis, Shock Prevention, Instrument Safety Design, cases, electric systems design, safety standards	**8**
Unit 4	Design of biomedical instrumentation for utility, safety ergonomics, cost, space, ventilation, operation, maintenance, installation requirement.	**7**
Unit 5	Biomedical signal processing: ECG signal analysis, ECG QRS detection EEG signal analysis for Epilepsy, $\propto$ β θ δ activity, artifact detection and elimination, intelligent testing.	**9**

Text Books:

1. Harry. N. Norton, 'Biomedical Sensors- Fundamentals and applications'(William Andrew Publications) (1982)
2. Richard S.C. Cobbold, 'Transducers for Biomedical measurements' (Krieger Publishing Company)
3. John G. Webster, 'Medical Instrumentation application and design' 3 edition (Wiley) (1997).

Reference Books:

4. S. G. Kahalekar, Introduction to Biomedical Instrumentation, Sadhudha Prakashan, Nanded.
5. J. G. Webster, Biomedical Instrumentation, John Wiley and Sons, Hoboken, NJ, 2004.
6. J. Carr and J. Brown, Introduction to Biomedical Equipment Technology, Pearson Education,
7. R. S. Khandpur, Hand book of Biomedical Instrumentation, Prentice Hall of India Pvt Ltd, New Delhi, India, 1996.
8. W.J. Tomplans, Biomedical digital signal processing PH publication, New Dehli 2004

B. Tech EC 7th sem

Analog Signal Processing (BEC 043)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Liner Analog Functions: Addition , Subtraction, Differentiation, Integration, Impedance Transformation and Conversion	**9**
Unit 2	AC/DC Signal Conversion: Signal Rectification, Peak and Valley Detection, rms to dc Conversion, Amplitude Demodulation	**9**
Unit 3	Other Nonlinear Analog Functions: Voltage Comparison, Voltage Limiting(Clipping), Logarithmic Amplifiers, Analog Multipliers, Analog Dividers	**7**
Unit 4	Continuous time op-amp RC filters: Second order LP, HP, BP, Notch and AP transfer functions, Kirwin-Huelsman-Newcomb biquad, Ackerberg-Mosberg Circuits, Tow-Thomas biquad, compensated integrators, Sallenkey Circuits, Generalized convertor, GIC biquads.	**7**
Unit 5	Transconductance-C filters: Transconductance cells, realization of resistors, integrators, amplifiers, summers and gyrators, first order and second order sections, Ladder design.	**7**

Text Books:

1. Ramon Pallas-Areny, John G. Webster, "Analog Signal Processing", John Wiley& Sons
2. R. Schaumann and M. E. Valkenberg, "Design of Analog Circuits", Oxford University Press, 2001.

B. Tech EC 7th sem

Optical Communication (BEC 044)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal Analysis of a step index fiber.	**8**
Unit 2	**Optical channel Modeling** – Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers measurement techniques like OTDR	**8**
Unit 3	**Optical sources** – LEDs and Lasers, Photo-detectors, Pin-detectors, detector responsively noise, Optical link design, BER calculation, quantum limit, power penalties.	**7**
Unit 4	**Optical switches** – coupled mode analysis of directional couplers electro-optic switches	**8**
Unit 5	Nonlinear effect in fiber optic links, Concept of self-phase modulation, group velocity dispersion and soliton based communication. Optical amplifiers – EDFA, Raman amplifier and WDM systems.	**9**

Text Books:

1. J. Keiser, Fiber Optic Communication, McGraw-Hill
2. J. Gower, Optical Communication systems, Prentice Hall, India.

Reference Books:

3. G. Agrawal, Nonlinear fiber optics, Academic Press.
4. G. Agrawal, Fiber optic Communication systems, John Wiley and sons
5. J. Senior, Optical Fiber Communication.

B. Tech EC 7th sem

IC Technology (BEC-045)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Introduction to CMOS circuits:** MOS Transistors and Switches, CMOS Logic Inverter, Combinational logic, NAND and NOR gates, Compound gates and Multiplexers, Memories, Circuit and System Representation, behavioral, structural and physical representations Operating Principles of MOS Transistors: Introduction, NMOS and PMOS enhancement transistors, Threshold voltage and body effect , MOS device design equations, Basic DC equation, Second order effects, Complementary CMOS Inverter DC characteristics, Static load MOS inverters, Differential inverter, Transmission gate, Tri-state inverter, Bipolar devices	**10**
Unit II	**Diffusion:** Diffusion from a chemical source in vapor form at high temperature, diffusion from doped oxide source, diffusion from an ion implanted layer **Lithography:** Optical Lithography: optical resists, contact & proximity printing, projection printing, electron lithography: resists, mask generation. Electron optics: roster scans & vector scans, variable beam shape. X-ray lithography: resists & printing, X ray sources & masks. Ion lithography **Etching:** Reactive plasma etching, AC & DC plasma excitation, plasma properties, chemistry & surface interactions, feature size control & apostrophic etching, ion enhanced & induced etching, properties of etch processing. Reactive Ion Beam etching, Specific etches processes: poly/polycide. Trench etching.	**8**
Unit III	**Fabrication of CMOS Integrated Circuits:** An overview of silicon semiconductor technology, Wafer processing, Basic CMOS Technology, Basic n–well CMOS process, P-well process, Twin-Tub process, Silicon-on-Insulator process, CMOS process enhancements, Interconnects, Circuit elements, Layout design rules, Layer representations, CMOS n-well rules, Latch-up, Physical origin, Triggering, Prevention techniques	**9**
Unit IV	Technology-related CAD issues, Spacing and dimension checks, Circuit extraction, Circuit Characterization, VLSI Design Flow, Design Hierarchy, Design Strategies	**6**
Unit V	Resistance estimation, Capacitance estimation, Switching characteristics, Analytic delay models, Gate delay, CMOS-gate transistor sizing, Power transmission, Scaling of MOS transistor dimensions	**7**

Text Book:

1. C.Y. Chang and S.M. Sze (Ed), ULSI Technology, McGraw Hill

Reference books:

2. S.K. Ghandhi, VLSI Fabrication Principles, John Wiley
3. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hil

Internal Members:

Signature:	1……..	2……..	3……
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			

Open Elective*

BOE-071 Non-Conventional Energy Resources
BOE-072 Operations Researach
BOE-073 Quality Management
BOE-074 Nuclear Science

Departmental Elective-IV:

1. BEC041 Information security
2. BEC042 Bio Medical Instruments
3. BEC 043 Analog Signal Processing
4. BEC 044 Optical Communication
5. BEC 045 IC Technology

Departmental Elective-V:

1. BEC 051 Neural network
2. BEC 052 Telecommunication Switching
3. BEC 053 Nano Technology
4. BEC 054 Introduction to Radar Systems
5. BEC 056 Space sciences

Departmental Elective-VI:

1. BEC 061 Satellite Communication
2. BEC 062 Memory Technologies
3. BEC 063 Artificial Intelligence
4. BEC 065 Non-linear dynamic systems
5. BEC 066 Low Power VLSI Design

Departmental Elective-V

B. Tech EC 8th sem

Neural Network (BEC 051)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction: Biological Neural Networks, Characteristics of Neural Networks, Models of Neuron, Basic Learning Rules, Stability & Convergence. Supervised Learning Neural Networks, Adaptive networks, Adaline and madaline, Single layer and multi layer perceptrons Radial basis function networks, Modular neural networks	**9**
Unit 2	Feedback Neural Networks, Analysis of linear auto adaptive feed forward networks, Analysis of pattern storage Networks, Stochastic Networks & Stimulated Annealing, Boltzman machine Unsupervised Learning Networks, Competitive learning, Kohonen self-organizing maps, learning vector quantization Principal component analysis of Hebbian Learning, Adaptive Resonance Theory	**9**
Unit 3	Architectures for Pattern Recognition, Associative memory, Pattern mapping, Stability – Plasticity dilemma, ART, temporal patterns, Pattern visibility: NBOCognitron	**7**
Unit 4	Applications of Neural Networks, Pattern classification, Associative memories, Optimization, Applications in Image Processing, Applications in decision making	**7**
Unit 5	Fuzzy Set Theory Introduction to Fuzzy Set with Properties, Fuzzy Relations, Fuzzy Arithmetic, Fuzzy Logic, Applications and Fuzzy Control	**7**

Text Books:

1. B. Yegnanarayana, "Artificial Neural Networks", PHI
2. James A Freeman, David M Skapura, "Neural Networks-Algorithm s, Applications and Programming Techniques," Person Education
3. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Networks Using MATLAB 6.0" TMH Publication.

B. Tech EC 8th sem

Telecommunication Switching (BEC-052)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**TELECOMMUNICATION SWITCHING SYSTEMS :** Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system	**9**
Unit II	**Digital switching:** Switching functions, space division switching, Time division switching, two dimensional switching **TELEPHONE NETWORKS:** Subscriber loop systems, switching hierarchy and routing, transmission plan, numbering plan, charging plans. **SIGNALING TECHNIQUES:** In channel signaling, common channel signaling. Network traffic load and parameters, grade of service and blocking probability.	**8**
Unit III	**Telecom Traffic Engineering:** Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.	**7**
Unit IV	**Control of Switching Systems:** Introduction, Call processing functions, common control, Reliability availability and security; Stored program control. **ISDN:** Introduction, motivation, ISDN architecture, ISDN interfaces, functional grouping, reference points, protocol architecture, signaling, numbering, addressing, BISDN.	**8**
Unit V	**Signalling:** Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signaling principles, CCITT signalling system No. 6 and 7, Digital Customer line signalling. **DSL Technology:** ADSL, Cable Modem, Traditional Cable Networks, HFC Networks, Sharing, CM & CMTS and DOCSIS.SONET: Devices, Frame, Frame Transmission, Synchronous Transport Signals, STS I, Virtual Tributaries and Higher rate of service.	**8**

Text Books:

1. Thiagarajan Viswanathan, "Telecommunication switching System and networks", PHI.
2. J.E. Flood, "Telecommunication switching, Traffic and Networks", Pearson education.
3. J.C. Bellamy, "Digital Telephony", John Wiley, 3Ed.

B. Tech EC 8th sem

Nano Technology (BEC-053)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	Introduction, science behind nanotechnology, bio systems, molecular recognition, quantum mechanics & quantum ideas, optics. Smart materials & Sensors, self healing structures	**8**
Unit II	Heterogeneous nano structures & composites, encapsulations, natural nanoscale sensors, electromagnetic sensors, biosensors, electronic noses.	**8**
Unit III	Nanostructures, Micro/Nanodevices, Nanomaterials Synthesis and Applications, Molecule-Based Devices- Introduction to Carbon Nanotubes, Nanowires	**8**
Unit IV	Introduction to Micro/Nanofabrication.- Stamping Techniques. Methods and Applications. Materials Aspects of Micro- and Nanoelectromechanical Systems- MEMS/NEMS Devices and Applications, Nanodevices, Scanning Probe Microscopy	**8**
Unit V	Noncontact Atomic Force Microscopy and Its Related Topics - Low Temperature Scanning Probe Microscopy, Dynamic Force Microscopy- Nanolithography, Lithography using photons, electron beams soft lithography, Bio- medical applications.	**8**

Text/Reference Books:

1. Mark Ratner, Daniel Rattner, "Nanotechnology: A Gentle Introduction to the Next Big Idea", Pearson Education
2. Nanotechnology :Principals &practices, Sulbha K. Kulkarni, Capital publishing company, ISBN:-81-85589-29-1

B. Tech EC 8th sem

Introduction to RADAR Systems (BEC-054)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction to Radar:** Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar, The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm,, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses	**9**
Unit 2	**MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI Radar, Delay-Line Cancellers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	**7**
Unit 3	**Tracking Radar:** Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking accuracy, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)	**8**
Unit 4	**Detection of Signals in Noise:** Introduction, Detection Criteria, Detector, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers.	**7**
Unit 5	**Information from Radar Signals:** Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter	**9**

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, SECOND EDITION, McGraw-Hill
2. N.S. Nagaraja, "Elements of Electronic Navigation Systems", Tata McGraw-Hill, 2nd Edition

References Books:

3. Peyton Z. Peebles:, "Radar Principles", John Wiley, 2004
4. J.C Toomay, " Principles of Radar", 2nd Edition –PHI, 2004

B. Tech EC 8th sem

Space Science (BEC-055)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**Introduction:** Introduction to space science and applications, historical development. **Solar System:** Nebular theory of formation of our Solar System. Solar wind and nuclear reaction as the source of energy. Sun and Planets: Brief description about shape size, period of rotation about axis and period of revolution, distance of planets from sun,	**9**
Unit 2	Bode's law, Kepler's Laws of planetary motion, Newton's deductions from Kepler's Laws, Newton's Law of gravitation, correction of Kepler's third law, determination of mass of earth, determination of mass of planets with respect to earth. Brief description of Asteroids, Satellites and Comets.	**9**
Unit 3	**Stars:** Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation of elements. Classification of stars: Harvard classification system, Hertzsprung-Russel diagram, Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit.	**8**
Unit 4	**Galaxies:** Galaxies and their evolution and origin, active galaxies and quasars.	**7**
Unit 5	**Creation of Universe**: Early history of the universe, Big-Bang and Hubble expansion model of the universe, cosmic microwave background radiation, dark matter and dark energy.	**7**

Text Books/ References Books:

1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International Y. Koren "Robotics for Engineers" Mcgraw Hill.
2. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International

Departmental Elective-VI

B. Tech EC 8th sem

Satellite Communication (BEC061)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	**SATELLITE ORBITS:** Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse- Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion	**8**
Unit 2	**SPACE SEGMENT AND SATELLITE LINK DESIGN:** Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.	**8**
Unit 3	**SATELLITE ACCESS:** Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.	**8**
Unit 4	**EARTH SEGMENT:** Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.	**8**
Unit 5	**SATELLITE APPLICATIONS:** INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E mail, Video conferencing, Internet.	**8**

Text Books/References:

1. Satellite Communication, D. C. Agarwal, Khanna Publishers.
2. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.

B. Tech EC 8th sem

Memory Technologies (BEC062)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	Static Random Access Memories (SRAMs), SRAM Cell Structures, MOS SRAM Architecture, MOS SRAM Cell and Peripheral Circuit, Bipolar SRAM, SOl, Advanced SRAM Architectures, Application Specific SRAMs	**8**
Unit II	DRAMs, DRAM Cell, BiCMOS DRAM, Error Failures in DRAM, Advanced DRAM Design and Architecture, Application Specific DRAM, High Density ROMs, PROMs, Bipolar & CMOS PROM, EEPROMs, Floating Gate EPROM Cell, OTP	**8**
Unit III	EPROM, EEPROMs, Nonvolatile SRAM, Flash Memories. RAM Fault Modeling, Electrical Testing, Pseudo Random Testing-Megabit DRAM Testing-Nonvolatile Memory Modeling and Testing-IDDQ Fault Modeling and Testing-Application	**8**
Unit IV	Specific Memory Testing. General Reliability Issues, RAM Failure Modes and Mechanism, Nonvolatile Memory, Reliability Modeling and Failure Rate Prediction, Reliability Screening and Qualification. Radiation Effects, SEP, Radiation Hardening Techniques. Process and Design Issues, Radiation Hardened Memory Characteristics, Radiation Hardness Assurance and Testing,	**8**
Unit V	Ferroelectric Random Access Memories (FRAMs), Gallium Arsenide (GaAs) FRAMs, Analog Memories, Magneto Resistive Random Access Memories (MRAMs), Experimental Memory Devices. Memory Hybrids (2D & 3D), Memory Stacks, Memory Testing and Reliability Issues, Memory Cards, High Density Memory Packaging, Future Directions, Introduction to digital tablet PC, LCD, DVD player etc.	**8**

Text/Reference Books:

1. Ashok K. Sharma, " Semiconductor Memories Technology, Testing and Reliability ",Prentice-Hall of India Private Limited, New Delhi, 1997.
2. Manish Verma and Peter Marwedel “Advance Memory optimization techniques for Low Power Embedded processors”, Springer Publication.
3. Wen C. Lin, “Handbook of Digital System Design”, CRC Press.

B. Tech EC 8th sem

Artificial Intelligence (BEC063)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit 1	Introduction to Artificial Intelligence Definition, AI Applications, AI representations, properties of internal representations Heuristic Search Techniques, Best File Search, Mean and End Analysis, A* and AO* Algorithms	**9**
Unit 2	Neural Networks, Learning by training neural networks, Introduction to neural net works, Neural net architecture & applications, Natural language processing & understanding & paragmatic, Syntactic, Semantic, Qualities, finite state machines, RTN, ATN, understanding sentences	**8**
Unit 3	Game Playing & Predicate Logic Minimax search procedure, Alpha-beta cut-offs, Waiting for Quiescence, Secondary Search, Predicate Calculus, Predicate and arguments, ISA Hierarchy, Frame Notation, Resolution, Natural Deduction	**8**
Unit 4	Knowledge Representation Using Non-Monotonic Logic Truth Maintenance System, Statistical and Probabilistic Reasoning, Semantic-net Frames, Script, Conceptual Dependency.	**7**
Unit 5	Planning Block world, strips, Implementation using goal stack, Non-linear planning using goal stacks, Hierarchical planning, List commitment strategy Expert Systems Utilization and functionality, Architecture of expert systems, Knowledge representation, Two case studies on expert systems	**8**

Reference Books/Text Books:

1. Ela Kumar, "Artificial Intelligence" I. K. International.
2. Rajendra Akerkar, "Introduction to Artificial Intelligence" PHI
3. K. Uma Rao, "Artificial Intelligence and Neural Network", Pearson Publication
4. Eugane. Charniak, Drew McDermott, "Introduction to Artificial Intelligence", Pearson Education.
5. Kishan Mehrotra, Sanjay Rawika, K. Mohan, "Artificial Neural Network"
6. Rajendra Akerkar, "Introduction to Artificial Intelligence", Prentice Hall Publication
7. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Networks Using MATLAB" TMH Publication.

B. Tech EC 8th sem

Non-linear Dynamic Systems (BEC064)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Dynamic systems:** Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity. Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories	**9**
Unit II	**STABILITY-I:** Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.	**8**
Unit III	**STABILITY-II:**Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.	**8**
Unit IV	**Bifurcation:** Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension	**8**
Unit V	**Chaos:** Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos	**8**

Text/Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London.
2. H.K. Khalis, "Nonlinear Systems" Prentice Hall.
3. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall.
4. Stanislaw H. Zak, "Systems and control" Oxford University Press

B. Tech EC 8th sem

Low Power VLSI Design (BEC065)

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Introduction to VLSI design:** MOS Physics, Structure and operation of MOSFETs, MOSFET current- voltage characteristics, MOSFET Modeling, MOSFET Scaling, MOSFET Capacitances.	**8**
Unit II	**Low Power Design:** Introduction, Needs of Low power VLSI chips, dynamic power dissipation, short circuit power dissipation, leakage power dissipation.	**8**
Unit III	**MOSFET Scaling: constant** field scaling, constant voltage scaling, limitations on scaling of MOSFET, comparison between constant field and constant voltage scaling, advantages of scaling, disadvantages of scaling.	**8**
Unit IV	**Low–Power CMOS Logic Circuits:** Introduction, Low – Power Design through voltage scaling, Variable threshold CMOS Circuits, Multiple threshold CMOS circuits, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. **POWER ESTIMATION:** Power Estimation techniques, logic power estimation, Simulation power analysis, Probabilistic power analysis.	**8**
Unit V	**SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER:** Synthesis for low power – Behavioral level transform – software design for low power.	**8**

Text Books:

1. Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer

Reference Books:

3. J.B. Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley
4. A.P .Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design" Kluwer

LABORATORIES of 8th Sem

Major Project (BEC 851)

L T P **Credits – 1**
0 0 2

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

Internal Members:

Signature:	1……..	2……..	3……..
Name :	Mr. Amarish Dubey	Mr. Ravi Dixit	Mr. Deepak Patel
Date :	**(Convener)**		

External Members:

Signature:	1……..	2……..	3……..
Name :	Dr. Govind Sharma	Mr. Ram Chandra S Chauhan	Dr. Kumar Shubham
Date :			