RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.E. ELECTRONICS / ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING

B.E. THIRD SEMESTER

Mathematics III

Subject Code: BEETC-301T/BEEN-301T/BEEC-301T Credits: 03
Teaching scheme- Lectures (including activity based learning): 3 Hours/ Week
Examination Scheme T (U) : 70 Marks , T (I) : 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

The objective of this course is to provide students with understanding of

1. A primary objective is to introduce and develop advanced mathematical skills of students that are imperative for effective understanding of engineering subjects.
2. The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Apply Laplace Transform to solve ordinary differential equations, Integral equations and Integro-differential Equations.
2. Apply Fourier series in the analysis of periodic functions in terms sine and cosine encountered in engineering problems and Fourier Transform to solve integral equations.
3. Learn the concept of differentiating, integrating and expanding of analytic functions in complex numbers and their applications such as evaluation of integrals of complex functions.
4. Solve partial differential equations of first order, higher order with constant coefficients and of second order using method of separation of variables.
5. Analyze real world scenarios to recognize when matrices are appropriate, formulate problems about the scenarios, creatively model these scenarios in order to solve the problems using multiple approaches.
6. Understand the impact of scientific and engineering solutions in a global and societal context.
7. Create the groundwork for post-graduate courses, specialized study, and research in mathematics.

UNIT - I: LAPLACE TRANSFORM (14 Marks)

Definition, Properties (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform using partial fraction method and properties of Laplace transform, Convolution theorem (Statement only), Laplace transform of periodic functions (Statement only), Unit step function and unit impulse function (Statement only), Applications of Laplace transform to solve ordinary differential equations, Integral equations &Integro-differential equations

UNIT – II FOURIER SERIES & FOURIER TRANSFORM (14 Marks)

Fourier Series: Periodic functions and their Fourier expansions, Even and odd functions, Change of interval, Half range expansions. Fourier Transform: Definition and Properties (excluding FFT), Fourier integral theorem, Applications of Fourier transform to solve integral equations.

Unit III: FUNCTIONS OF COMPLEX VARIABLES (14 Marks)

Analytic function, Cauchy-Riemann conditions, Harmonic function (Excluding orthogonal system), Milne-Thomson method, Cauchy integral theorem & integral formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and singularities of analytic function, Residue theorem (Statement only).

Unit IV: PARTIAL DIFFERENTIAL EQUATIONS (8 Hrs)

Partial differential equations of first order first degree i.e. Lagrange's form, Linear homogeneous equations of higher order with constant coefficients, Method of separations of variables, Simple applications of Laplace transform to solve partial differential equations (One dimensional only).

Unit V: MATRICES (6 Hrs)

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largesteigen value and corresponding eigen vector by iteration method.

Text/Reference Books:

1. Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
2. Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.
3. Advanced Engineering Mathematics (S. Chand), H. K. Dass.
4. Applied Mathematics for Engineers and Physicists, L. A. Pipes and L. R. Harville.
5. Advanced Mathematics for Engineers, Chandrika Prasad.
6. A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M. Goyal

B.E. THIRD SEMESTER

COMPONENTS FOR ELECTRONIC CIRCUIT DESIGN

Subject Code: BEETC-302T/BEEN-302T/BEEC-302T Credits: 03
Teaching scheme- Lectures (including activity based learning): 3 Hours/ Week
Examination Scheme T (U) : 70 Marks , T (I) : 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

1. To learn the principle of Semiconductor Diodes.
2. To understand the working of different types of Diodes.
3. To study the working of Transistors.
4. To understand the internal structure of MOSFET, JFET and IC Fabrication.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1: Understand the principles of semiconductor physics

CO2: Understand the principles of semiconductor diode.

CO3: Understand and analyze the mathematical model of transistors.

CO4: Understand and analyze the mathematical model of unipolar transistors.

CO5: Understand the process of Integrated Circuit Fabrication.

UNIT - I: INTRODUCTION TO SEMICONDUCTOR PHYSICS (14 Marks)

Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams, Energy bands in metals, insulators, intrinsic and extrinsic semiconductor, Carrier transport: diffusion current, drift current, mobility and resistivity, Generation and recombination of carriers, Poisson and continuity equation

UNIT- II: P-N JUNCTION DIODE (14Marks)

P-N Junction, Biasing of diodes, Avalanche &Zener breakdown, I-V characteristics, Transition and Diffusion Capacitance, small signal switching models, Applications of Diode as a Rectifier, Switch, Clipper and Clamper, Zener diode, Zener diode as a voltage regulator, Varactor Diode, LED, Photodiode.

UNIT- III: BIPOLAR JUNCTION TRANSISTORS(14 Marks)

Construction and Types of BJT, Biasing of BJT, BJT Configurations, I-V characteristics,Stability Factors, Compensation Techniques of BJT, Thermal Runaway, Ebers-Moll Model,Transistor as an Amplifier.

UNIT- IV: UNIPOLAR TRANSISTORS(14Marks)

Construction & working of UJT, JFET, JFET parameters, C-V characteristics, Biasing of JFET, Low frequency model of JFET and its analysis. MOSFET (E-type & D-type), I-V characteristics, MOS capacitor and small signal models of MOS transistor.

UNIT- V: FABRICATION OF IC(14Marks)

Integrated circuit fabrication process: Oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process. Sheet resistance, design of resistors.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. Familiarization with Resistor
2. Familiarization with Capacitor
3. Familiarization with Inductor
4. Ohm's Law
5. VI Characteristics of a Diode
6. Half Wave Rectification
7. Full Wave Rectification
8. Capacitative Rectification
9. Zener Diode-Voltage Regulator
10. BJT Common Emitter Characteristics
11. BJT Common Base Characteristics
12. Studies on BJT CE Amplifier
13. RC Frequency Response
14. RC Differentiator and Integrator
15. Black Box
16. I-V Characteristics and Fabrication of p-n junction Diode
17. I-V Characteristics of LED Diode
18. Rectifier Circuits
19. Wave Shaping Circuits using Diodes

20. BJT characteristics
21. BJT biasing and amplifier response
22. RC circuits
23. Wien Bridge Oscillator
24. Monostable and Astablemultivibrators using IC 555
25. Design and Simulate Analog to Digital Converter and Digital to Analog Converter
26. Implementation of monostable and astable oscillator using IC 555
27. Characterize the temperature sensor (RTD)
28. Simulate the performance of a bio-sensor
29. Measurement of level in a tank using capacitive type level probe
30. Characterize the LVDT
31. Design an orifice plate for a typical application
32. Simulate the performance of a chemical sensor
33. Characterize the strain gauge sensor
34. Characterize the temperature sensor (Thermocouple)
35. Grounding Practices

Web links:

1. http://vlabs.iitkgp.ernet.in/be/index.html
2. https://ee-iitb.vlabs.ac.in/
3. https://slcoep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

Text Books:

1. J. Millman and Halkias : ”Electronic devices and circuits” , TMH Publications
2. Boylestad&Nashelsky : ”Electronic Devices & Circuit Theory” , PHI publications.
3. Salivahanan, Suresh Kumar, Vallavaraj: ”Electronic devices and circuits”, TMHPublications.
4. G. Streetman, and S. K. Banerjee, ”Solid State Electronic Devices,” 7th edition, Pearson,2014.
5. D. Neamen , D. Biswas, ”Semiconductor Physics and Devices,” McGraw- Hill Education.

Reference Books:

1. S. M. Sze and K. N. Kwok, ”Physics of Semiconductor Devices,” 3rd edition, John Wiley & Sons, 2006.
2. C.T. Sah, ”Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991.
3. Y. Tsividis and M. Colin, ”Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.

B.E. THIRD SEMESTER

COMPONENTS FOR ELECTRONIC CIRCUIT DESIGNLAB

Subject Code: BEETC-302P/BEEN-302P/BEEC-302P Credits: 01
Teaching Scheme Practicals: 2 Hours/ Week
Examination Scheme: P (U) :25 Marks , P (I) : 25 Marks

Course Objectives:

To study basic concepts, DC circuits, AC circuits, semiconductors, Semiconductor devices, Power supply, Bipolar and Field effect transistor amplifiers, Frequency response of amplifier.

Course Outcomes:

After completion of the practical students will be able to:

CO1: Explain the basic concepts of different semiconductor components.

CO2: Understand the use of semiconductor devices in different electronic circuits.

CO3: Calculate different performance parameters of transistors.

CO4: Plot and study the characteristics of semiconductor devices.

Instructions:

1. Minimum 9 Practical including one mini project needs to be conducted (In the list given below, wherever a,b,c categories listed can be offered to different groups in the samebatch of praticals.
2. All practicals must be performed on breadboard.
3. One mini project using transistor, MOSFET and general components to be executed on general purpose PCB
4. Minimum 10 viva and tinkering questions to be asked at the end of every experiment. Viva questions should be related futuristic variation in the experiments carried out.
5. Minimum 1 practical to be conducted from every unit.

List of Experiments:

1. Familiarization with the Electronic Instruments like function generator, CRO, DC power supply, use of multimeter as voltmeter, ammeter, Ohmmeter, continuity meter, different types of transformers and Centre tapped transformer, Dimmer stat, Rheostat, AC voltage tester, concept of earthing. Measurement of voltage and frequency with CRO and DSO. Concept of saving and accessing waveform on DSO.
2. Familiarization with different types of passive electronic components like resistor, inductor, capacitor. And miscellaneous components like winding wire, Ferrite Cores, connectors, general purpose PCB, and Bread board, relays, diodes, etc.
3. To study basic wiring and design a switchboard/extension board for power distribution of 230V AC and electrical safety, fuses and MCBs, ELCB, contactors etc.
4. To study the concept of phase shift on CRO and DSO and measure phase shift in degrees and radians.

5. Design a a) forward bias circuit of a 1n4001 diode with a DC voltage of 5V and which will provide 5mA current with a suitable series resistor. Find unknown resistor and internal forward resistance of diode using this experiment. Measure forward voltage drop across diode, b)Design a reverse bias circuit of a 1n4001 diode with a DC voltage of 5V. Measure the reverse bias current and find reverse resistance of this diode.
6. Design a a) Half-wave rectifier using a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage. b) Design a Full-wave rectifier using two diodes and a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage, c)Design a Bridge wave rectifier using four diodes and a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage. Compare answers with two diode rectifier and half wave rectifier.
7. Design a)Unregulated power supply of 12V DC using bridge wave rectifier. Ripple voltage should be less than 5mVpp. b) Convert this to regulated power supply using 7812 Linear voltage regulators.Measure efficiency against input supply variation. Plot the graph of efficiency verses input supply variation.
8. Design diode 1N4001 as a positive and negative clipper with a peak to peak voltage of 5Vpp and load resistance of 5kOhms. Use suitable frequency. Plot Waveforms.
9. Design a diode in voltage clamping mode with doubling the voltage for input voltage of 5Vpp and frequency of 50Hz.
10. To determine the operating voltages of different colours of LEDs and measure minimum current and forward bias voltages across them.
11. Design an optocoupler based switching circuit to switch a group of 5 LEDs connected in parallel.
12. To design Transistor as a switch using a driving Relay and switch on and off a 230 V AC/10 W LED Bulb using concept and circuit modification of a) a normally open (N/O) switch (inverter) and b) a normally closed(N/C) switch.
13. To design transistor as an audio amplifier using microphone to amplifier different audio frequencies of 20Hz to 20kHz, test it on DSOs and save different pattern of waveforms at different frequencies, Measure its efficiency.
14. To design a) Audio Frequency Oscillator (RC) of 1kHz using transistor by determining values of R and C for a fixed frequency, b)To design Radio Frequency Oscillator of 1MHz (LC) by determining values of L and C for a fixed frequency.
15. To design transistorized AstableMultiviabrator for a frequency of 5kHz and 5Vpp.
16. To design a D.C. Power supply of 9V using Full Wave Rectifier of two diodes 1N4007 and suitable Zener Diode. Calculate efficiency.
17. To design an LED blinking circuit using Transistor BC547 and LDR. Use 12V DC power supply for biasing.
18. a)To measure the unknown values of inductors and capacitors using the Voltage divider and AC voltage of 24 V pp and 50Hz frequency, b)To find the value of unknown capacitor using a series RC circuit and AC voltage of 12Vpp and 50Hz, c)To find the value of unknown inductor using a series RL circuit and AC voltage of 12Vpp and 50Hz.
19. a)To use BJT as driver for amplifying switching pulses to 9Vpp at different switching frequencies of 1kHz to 100kHz,b)To use MOSFET as driver for amplifying switching pulses to 12Vpp at different switching frequencies of 1kHz to 100kHz, c)To use IGBT as driver for amplifying switching pulses to 15Vpp at different switching frequencies of 1kHz to 100kHz.
20. To develop an LED blinking of on and off time of 1second each using a charge and discharge concept of RC circuit.

B.E. THIRD SEMESTER

DIGITAL SYSTEM DESIGN

Subject Code: BEETC-303T/BEEN-303T/BEEC-303T Credits: 04
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week
Tutorial: 1 Hours / Week
Examination Scheme T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

1. To study various digital gates and construction of various logic circuits using basic gates.
2. To study combinational circuits.
3. To study Flip flops & its applications.
4. To study fundamentals of microprocessor & to understand the concept of Assembly language programming.
5. To study different interrupt techniques.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1: Demonstrate the knowledge of: Logic gates, Boolean algebra including algebraic manipulation/simplification and Application of DeMorgan's Theorem, Karnaugh map reduction method.

CO2. Construct basic combinational circuits and verify their functionalities.

CO3. Illustrate and apply the knowledge of different flip flops to build sequential digital circuits.

CO4. Apply the fundamental knowledge about digital electronics so as to construct and analyze digital circuits like counters and sequence generators.

CO5. Demonstrate and apply programming proficiency using the various addressing modes and instructions of the target microprocessor

Course Contents

UNIT – I: FUNDAMENTALS OF DIGITAL CIRCUIT (14 Marks)

Number System, Boolean Algebra, Logic Gates and their truth tables, D Morgan's Laws, k-map representation (SOP & POS forms), Minimization of logical functions for min-terms and maxterms (upto 5 variables), Introduction of logic families based on characteristics -Speed of operation, power dissipation, figure of merit, fan in, fan out.

UNIT- II COMBINATIONAL CIRCUIT (14Marks)

Arithmetic Circuits, Adders and their use as substractor, ALU, Digital Comparator, Parity generators/checkers. Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers, Encoders & Decoders. BCD - to – 7 segment decoder, Code converters.

UNIT- III: SEQUENTIAL LOGIC DESIGN(14 Marks)

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops, Registers, Shift registers.

UNIT- IV: APPLICATION OF FLIP-FLOP(14Marks)

Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out.

UNIT - V: 8085 PROGRAMMING &INTERRUPTS (14Marks)

Introduction to Intel's 8085, Architecture-description, Pin description, Addressing Modes. 8085 instruction set, Concept of assembly language programming, Interrupts.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. Analysis of Functions of BCD-TO-7-segment Decoder / Driver and Operation of 7-segment LED Display
2. Characterization of Digital Logic Families
3. Analysis and Synthesis of Boolean Expressions using Basic Logic Gates
4. Analysis and Synthesis of Logic Functions using Multiplexers
5. Analysis and Synthesis of Logic Functions using Decoders
6. Analysis and Synthesis of Boolean Relations using Digital Comparators
7. Analysis and Synthesis of Arithmetic Expressions using Adders / Subtractors
8. Analysis and Synthesis of Sequential Circuits using Basic Flip-Flops
9. Analysis and Synthesis of Multi-bit Sequential Circuits using Shift Registers
10. Design of Arithmetic Logic Unit (ALU)
11. Washing machine control using basic AND and NOT gates
12. Basics of OR gate and its application in industrial control
13. Basics of NOT gate and its application in an eight bit ones complement circuit
14. Basic NOT gate and its application in fuel level indicator
15. Seat belt warning system using basic AND and NOT gates
16. Basics of AND gate and its application in car wiper control
17. Water level control using basic AND and NOT gates
18. Electronic lock using basic logic gates
19. Universal NAND gate and its application in level monitoring in chemical plant
20. Universal NOR gate and its application in automobile alarm system

21. XOR gate and its application in staircase light control
22. Majority circuit using basic logic gates
23. Cockpit warning light control using basic logic gates
24. DIY Build your own combinational logic circuit using generalized simulator
25. Design of multiplexer circuit using gates
26. Multiplexer using Universal logic gates
27. Demultiplexer using basic logic gates
28. Demultiplexer using Universal logic gates
29. Application of Multiplexer
30. Implementation of 8:1 multiplexer using MSI ICs
31. Design of four variable function using MSI ICs
32. Design of Gray to Binary code converter using MSI ICs
33. Design of Binary to Gray code converter using MSI ICs
34. Implementation of binary adder using MSI ICs
35. Design of binary subtractor using MSI ICs
36. Implementation of 4-bit digital comparator using MSI ICs
37. Design of 8 -bit digital comparator using MSI ICs
38. Construction of half and full adder using XOR and NAND gates and verification of its operation
39. To Study and Verify Half and Full Subtractor
40. Realization of logic functions with the help of Universal Gates (NAND, NOR)
41. Construction of a NOR gate latch and verification of its operation
42. Verify the truth table of RS, JK, T and D flip-flops using NAND and NOR gates
43. Design and Verify the 4-Bit Serial In - Parallel Out Shift Registers
44. Implementation and verification of decoder or de-multiplexer and encoder using logic gates
45. Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates
46. Design and verify the 4- Bit Synchronous or Asynchronous Counter using JK Flip Flop
47. Verify Binary to Gray and Gray to Binary conversion using NAND gates only
48. Verify the truth table of one bit and two bit comparator using logic gates
49. To implement Half adder & Full adder by using basic and universal gates
50. To study Parallel Binary Adder
51. To study a BCD to 7 Segment LED display decoder
52. Study of Binary to Grey code converter
53. Implementation of Boolean Functions using MUX
54. To study the J-K FF and conversion of D and T flip flop to JKFF.
55. To study a simple two-bit ripple counter
56. Design a synchronous up/down counter
57. Design and Implementation of Various Arithmetic Circuits
58. Design and Simulate Various Code Converters
59. Design and Simulation of Various Counters and Shift Registers
60. Design and Simulation of Arithmetic Logic Unit
61. Design and Simulation of Decoders, Encoders, Multiplexer and Demultiplexer

Web links:

1. http://vlabs.iitkgp.ernet.in/dec/index.html#
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/digital_application/experimentlist.html
3. http://vlabs.iitb.ac.in/vlabs-dev/labs/dldgates/experimentlist.html
4. http://vlabs.iitb.ac.in/vlabs-dev/labs/dldesignlab/experimentlist.html
5. https://vlab.amrita.edu/?sub=3&brch=81
6. https://de-iitr.vlabs.ac.in/List%20of%20experiments.html

Text Books:

1. Morris Mano : “An approach to digital Design”, Pearson Publications.
2. Ramesh Gaonkar : “ Microprocessor Architecture, Programming and Applications with the 8085”, Penram International Publications.
3. R. P. Jain : “Modern digital electronics” , TMH Publications.

Reference Books

1. WakerlyPearon : “Digital Design: Principles and Practices”, PearonEducationPublications.
2. Mark Bach : “Complete Digital Design”, Tata MCGraw Hill Publications.
3. W. Fletcher : “Engg. Approach to Digital Design”, PHI Publications.

B.E. THIRD SEMESTER

DIGITAL SYSTEM DESIGNLAB

Subject Code: BEETC-303P/BEEN-303P/BEEC-303P Credits: 01
Teaching Scheme Practicals: 2 Hours/ Week
Examination Scheme P (U):25 Marks, P (I):25 Marks

Course Objectives:

The course objectives are:

1. To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.
2. To perform a practical based on microprocessor.

Course Outcomes:

After the completion of practical, the students will be able to:

CO1: Demonstrate the different Boolean Laws & basics of K-map to realize combinational & sequential circuits.

CO2: Identify the various digital ICs & understand their operation.

CO3: Describe the operation & timing constraints for latches, registers, different sequential circuits.

CO4: Solve basic binary math operations using microprocessor & explain the internal architecture & its operation within the area of manufacturing & performance.

CO5: Select programming strategies & proper mnemonics & run their program on the training boards.

NOTE:

1. All experiments need to be conducted on breadboard. No readymade kits should be used. Total 9 experiments including one mini project needs to be conducted.
2. Use LEDs, breadboard, and 5V to 12V power supply for all digital experiments
3. Minimum 6 experiments needs to be conducted from hardware list
4. Minimum 2 experiments to be conducted on Microprocessor 8085
5. Minimum one mini project on general purpose PCB/etched PCB to be conducted

List of Experiments:

1. To verify NAND(IC 4011) & NOR(IC 4001) gates as a universal gate.
2. Implementation of the given Boolean function using logic gates in both Sum of products (SOPs) and Product of Sum (POS) forms.
3. Design and implementation of code converters using Logic gates.
4. To design and verify operation of half adder and full adder(IC CD 4008).
5. Implementation of 4-bit parallel adder using CD 4008 IC.
6. Implementation and verification 16:1 multiplexer using 8:1 Mux(CD 4051) and 2:1 Mux
7. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
8. To explore 4 bit ALU(CD 40181) and verify its function table

9. Verification of state tables of RS, JK, T and D flip-flops using NAND(IC 4011) & NOR(IC 4001) gates.
10. Design and implement the sequential circuits such as registers and sequence generator.
11. Simplification and implementation of a Boolean function using k -map technique
12. Design and implementation of Binary,BCD adders and Subtractor using IC 4008 and gates
13. Design and implementation binary and BCD comparator using of using CD 4063
14. Parity generator and checker using X-OR gate(CD 4070)
15. Design and implementation of ripple and synchronous counters using JK(CD 4027) and D FF(CD 4013) and additional gates
16. Design of counter using ICs like 4029 (ripple) and CD 40192(synchronous)
17. Design and implementations of random sequence counter using JK(CD 4027) and D FF(CD 4013) ICs
18. Study of shift registers CD 54HC194 for different modes.
19. Study of characteristics of typical TTL and CMOS IC's like fan out, noise margin, propagation delay
20. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
21. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
22. To find the largest and smallest number in an array of data using 8085 instruction set.

MINI PROJECT: -

Design of a 230 V AC on off circuit for a 10W LED bulb using a single pushbutton, 2 push buttons. Automatically this light should be switched off after a duration of 30 second using any digital IC concept. Use any components, relay or resistors.

B.E. THIRD SEMESTER

Network Theory

Subject Code: BEETC-304T/BEEN-304T/BEEC-304T Credits: 03
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week
Examination SchemeT(U) : 70 Marks , T (I) : 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

The objective of this course is to provide students with understanding of

1. Various methods of analysis of electric networks under transient and steady state conditions.
2. Concrete foundation needed to learn future professional courses.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Apply mesh and node voltage method to model and analyze electrical circuits.
2. Apply network theorems for the analysis of networks.
3. Obtain the transient and steady-state response of electrical circuits.
4. Synthesize waveforms and apply Laplace transforms to analyze networks.
5. Evaluate different Network Functions and Analyze two port network behavior

UNIT - I: Sources and Mesh Analysis (14 Marks):
Voltage, Current sources, source transformation and reduction, mesh basis equilibrium approach for complicated network containing independent sources and reactances.
Node Voltage Analysis (5 hours):
Nodal Basis equilibrium equation, matrix for electrical network containing independent sources and reactances. Duality.

UNIT- II: Network Theorems (14 Marks):
Superposition, Thevenin's, Norton's, Maximum Power transfer, Reciprocity, Tellegen's theorem as applied to A. C. & D. C. circuits (problems with dependent sources are also to be dealt)

UNIT- III: Solution of First and Second order Networks (14 Marks):
Solution of first and second order differential equations of different combinations of series and parallel RLC networks, initial and final conditions in network elements, free and forced response, time constants.

UNIT- IV: Electric Circuit Analysis using Laplace Transforms (14 Marks):
Review of Laplace transform, waveform synthesis, Analysis of electrical circuits using Laplace transform for standard inputs, analysis of networks with and without initial conditions using Laplace transforms.

UNIT- V: Two port networks and Network functions (14 Marks):
Two port networks, relationship between two port variables, driving point and transfer functions, properties, concept of complex frequency, Poles and zeros, evaluation of response from pole zero locations.
Two port network parameters: Impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnection of two port networks.

Text Books:

1. Van Valkenburg, "Network Analysis", Third Edition, 2009, Prentice Hall of India
2. Sudhakar, A, Shyammohan, "Circuits and Networks", Third Edition, 2006, Tata McGraw-Hill.
3. D. Roy Choudhary, "Networks and Systems", New Age International Publishers, 2nd Edition, 2012
4. Kelkar and Pandit, "Linear Network Theory", Pratibha Publications.

Reference Books:

1. MahmoodNahvi, Joseph A Edminister, "Schaum's outline of Electric Circuits", 6th Edition, Tata McGraw-Hill, 6th Edition, 2013
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
3. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
4. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
5. K. Sureshkumar, "Electric Circuits & Network", Pearson Publication
6. Del Toro, "Electrical circuit", Prentice Hall

B.E. THIRD SEMESTER

SIGNALS AND SYSTEMS

Subject Code: BEETC-305T/BEEN-305T/BEEC-305T Credits 03
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week
Examination SchemeT(U) : 70 Marks , T (I) : 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

1. To introduce the fundamentals, basic characteristics, concept techniques of signals & systems.
2. Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
3. Development of the mathematical skills like Fourier series, Fourier transforms, Random theory to solve problems involving convolution, filtering, modulation and sampling.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1: Classify different types of signals and systems

CO2: Illustrate the concept of Linear Time Invariant (LTI) system and its properties.

CO3: Analyze continuous time periodic and aperiodic signals.

CO4: Analyze continuous time systems using Laplace Transform.

CO5: Analyze DT signals and systems in frequency domain using Fourier Transform.

Course Contents:

UNIT - I: CLASSIFICATION OF SIGNALS AND SYSTEMS (14 Marks)

Standard signals: Step, Impulse, Ramp, Real & complex exponentials,sinusoidal. Classification of signals: Continuous time(CT) and Discrete Time (DT) signals, Periodic and aperiodic signals, Deterministic and random signals, Energy and power signals.
Sampling: Introduction, Need for perfect reconstruction, Sampling theorem, Nyquist rate of sampling, zero order hold and first order hold.Classification of Systems: Continuous time and Discrete time, Static and dynamic, Linear and nonlinear, Time-variant and Time-invariant, Casual and non-casual, Stable and unstable, Invertible and Inverse system.

UNIT- II: LINEAR TIME-INVARIANT SYSTEMS (14Marks)

Introduction, Continuous-Time LTI systems: The Convolution Integral, Properties of Linear Time Invariant systems, LTI Systems with and without memory, Invertibility of LTI systems, Causality for LTI systems, Stability for LTI systems, The unit step response of an LTI system, Block diagram representations of first-order systems described by differential equation

UNIT- III: ANALYSIS OF CONTINUOUS TIME PERIODIC AND APERIODIC SIGNALS (14Marks)

Fourier Series: Trigonometric Fourier Series, Exponential Fourier Series, Fourier Transform Properties: Linearity,Time Shifting, Time and frequency scaling, Duality, Multiplication property, Differentiation and Integration, Convolution property.Parseval's relation.

UNIT- IV: LAPLACE TRANSFORM(14Marks)

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis of LTI systems.

UNIT- V: DISCRETE TIME FOURIER TRANSFORM (DTFT) (14Marks)

Introduction, Representation of aperiodic Signals: The Discrete-Time Fourier Transform, The Fourier Transform of periodic signal, Properties of Discrete-Time Fourier Transform, Frequency response of discrete time LTI systems.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. Exp-1 Signals and their properties

Demonstration of different signals and their properties. There are FIVE sub-experiments within this experiment.

2. Exp-2 System and their property

Demonstration of Salient properties systems. There are THREE sub-experiments within this experiment.

3. Exp-3 Fourier analysis of signals

Analysis of Fourier properties of Signals. There are SIX sub-experiments within this experiment.

4. Exp-4 Sampling and signal reconstruction.

Demonstration of sampling/ reconstruction of signals and spectral analysis using DFT. There are FIVE sub-experiments within this experiment.

5. Exp-5 Analysis of LTI system response.
    - Convolution and correlation of signals.
    - Study of sampling theorem, effect of undersampling
    - Study of properties of Linear time-invariant system.
    - Study of Discrete Fourier Transform (DFT) and its inverse
    - Study of Transform domain properties and its use

Web links:

1. https://vlab.amrita.edu/?sub=3&brch=81
2. http://ssl-iitg.vlabs.ac.in/Signal%20and%20their%20properties%205(theory).html
3. http://vlabs.iitkgp.ernet.in/dsp/index.html#

Text Books:

1. Signals and Systems, A. Anand Kumar, PHI Learning Private Limited.
2. Oppenheim, Wilsky, Nawab, “Signals and Systems”, Person Education Publications
3. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Reference Books

1. Simon Haykin, Barry Wan Veen : “Signals and Systems”, John Wiley and Sons Publications.
2. K.Lindner, “Signals and Systems”, McGraw Hill International, 1999.
3. B.P. Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, c1998
4. John G. Proakis, Dimitris G. Manolakis,“ Digital Signal Processing”, 4th Edition, Pearson Prentice Hall, c 200

B.E. THIRD SEMESTER

MEASUREMENTS AND INSTRUMENTATION

Subject Code: BEETC-306T/BEEN-306T/BEEC-306T Credits 03
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week
Examination Scheme T (U): 70 Marks , T (I): 30 Marks
Duration of University Exam. : 03 Hours

Course Objectives:

1. Necessary foundation of electronic measurement techniques and its use for voltage, current, power, energy, frequency & time measurement.
2. Working principle and use of moving coil instruments for measurements of voltage, current, power, energy etc.
3. Understanding application of bridges in resistance, capacitance and Inductance measurement and their use in real life industrial applications.
4. Knowledge of working principle of various instruments like CRO, DSO, LCR, and Spectrum Analyzer for testing and measurement. Upon completion of this course, students will demonstrate the ability to:

Course Outcomes:

CO1: Select and use precise/accurate instrument for measurement of various electrical Parameters and to understand its technical specifications.

CO2: Identify and minimize errors in electrical/electronic measurement.

CO3: Understand analog and digital measurement.

CO4: Measure power and frequency with the help of function generators and different analyzers.

CO5: Understand modern trends in telemetry systems.

Course Content:

UNIT – I: REVIEW OF INDICATING, INTEGRATING INSTRUMENTS and INSTRUMENTATION: (14 Marks)

Purpose of instrumentation, Basic elements of instrumentation, Statistical analysis and measurement of errors, Principle and operation of ammeters, voltmeters and wattmeters, moving iron and moving coil, dynamometer, Multimeter and Energy Meter. Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermisters, thermocouples, photo-diodes,photo-transistors encoder type digital transducers, signal conditioning and Data Acquisition Systems.Sensors for measurement of Liquid level, Gas flow, liquid flow, Pressure, Humidity, Temperature, Vibration, Acceleration etc.

UNIT – II: DETECTORS AND BRIDGES: (14 Marks)

PMMC galvanometer, dc & ac voltmeter, ammeter, multimeter, watt-hour meter, three phase wattmeter, power factor meter, instrument transformers. Measurement of low, medium and high resistance. General Balance Equation; Circuit diagram; Phasor diagram and Advantages as well as Disadvantages and Applications of Wheat stone, Kelvin, Max-well, Hay, Schering,

Weinbridge Potentiometers, Measurement of Inductance, capacitance using AC bridges like Anderson, Ownens; DeSauty's. Shielding and earthing.

UNIT – III: ANALOG/ DIGITAL MEASUREMENT SYSTEMS: (14Marks)

Signal conditioning measurement meters,Electronicmultimeter, Q-meter, RF power and voltage measurements. Measurement of Energy- A.C. single phase and poly-phase induction type energy meters. Oscilloscope: Digital storage oscilloscope – 2 and 4 channel, delay line, multiple trace, Triggering, delayed sweep. HMI systems for SCADA,

UNIT – IV: FREQUENCY AND POWER MEASUREMENT: (14Marks)

Frequency, and Time measurement, signal analysis. frequency counters – measurement of frequency and time interval – extension of frequency range. Function generators – RF signal generators – Sweep generators – Frequency synthesizer –wave analyzer – Harmonic distortion analyzer – spectrum analyzer, Recent trends/developments.

UNIT V: TELEMETRY SYSTEMS: (14Marks)

What Is Telemetry? How Telemetry Works, Benefits of Telemetry, Challenges. Learn by exploring some of the tutorials on following platforms -

- Windows Azure: Telemetry Basics and Troubleshooting
- Instrumenting Your App for Telemetry and Analytics
- Software Project Telemetry
- Telemetry Dashboard Documentation – Mozilla
- Building a Scalable Geolocation Telemetry System in the Cloud using the Maps API

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. Measurement of Capacitance by Carey Foster Bridge
2. Measurement of Self Inductance of High Quality Factor Coil by Hay's Bridge
3. To study the Kelvin Double Bridge for Low resistance measurement

4. Measurement of Self Inductance by Maxwell's Bridge
5. Q meter Experiment
6. Measurement of Capacitance by Wien Series Bridge
7. Measurement of Capacitance by De Sauty's (Modified) bridge
8. Measurement of Self Inductance by Owen Bridge
9. Measurement of Self-Inductance by Maxwell Bridge
10. Measurement of Capacitance by Schering Bridge
11. Measurement of Self Inductance accurately by Anderson's Bridge
12. To determine the High Resistance by Megohm Bridge method
13. To study the Wien Robinson's Frequency Bridge
14. To find Galvanometer Constant
15. Mutual Inductance measurement by Campbell's Modification of Heaviside Bridge
16. Precision Resistance Measurement by Carey Foster Slide-Wire Bridge
17. Mutual Inductance measurement by Heydweiller Bridge
18. Verification of Reciprocity Theorem
19. Verification of Maximum Power Transfer Theorem
20. Determination of different parameters of Two-port network and verification of their interrelations. Frequency Response of 2nd order Active Filters
21. Estimation of Fourier Coefficients of a Periodic Signal through passive Network
22. Verification of Norton Theorem
23. Verification of Thevenin Theorem
24. Verification of Tellegen's Theorem
25. Verification of Superposition Theorem
26. Verification of Millman's Theorem
27. Three Phase Power Measurement
28. R-L-C Circuit Analysis
29. Tests on Single Phase Transformer
30. Verification of Compensation Theorem

Web links:

1. http://vlabs.iitkgp.ernet.in/asnm/index.html#

Text Books:

1. Electrical Measurement: A.K.Sawhney, DhanpatRai& Sons Publication, 11 Edition
2. Electronic Measurement Systems, 2nd revised edition, 2009: U. A. Bakshi, A. V. Bakshi, K. A. Bakshi, Technical Publications Pune

Reference Books:

1. Electronic Instrumentation & Measurement Technique: W. D. Cooper & A.D. Helfrick., 3rd Edition

B.E. THIRD SEMESTER

ELECTRONICS WORKSHOP I

Subject Code: BEETC-307P/BEEN-307P/BEEC-307P Credits 01
Teaching Scheme Lectures: 2 Hours/ Week
Examination Scheme P (U): 25 Marks, P (I): 25 Marks

Objectives:

To study basic concepts, of all active, passive components, sensors, actuators, and different types of Electronic components used DC circuits, AC circuits, semiconductors, Semiconductor devices, Power supply, Bipolar and Field effect transistor amplifiers, Frequency response of amplifier.

Course Outcome:

After completion of the practical the students will be able to

CO1: Explainthe Basic Concepts of Different Semiconductor Components with Their Usage Physically As Per Their Types

CO2: Use Semiconductor Devices in Different Electronic Circuits and Projects.

CO3: Calculate Different Performance Parameters ofActive and Passive Devices and their Datasheets.

CO4: Plot and Study the Characteristics of Semiconductor Devices.

Instructions:

Methodology

a. In each turn it is expected that students will handle all types of components mentioned for that term.
b. Teacher will give simple masked circuit diagram with description to the group of students and ask them to generate the bill of material by doing the design calculations. Teacher will guide how to do the calculations.
c. Teacher will take viva on the content which is covered.
d. In the 9th turn of practical, students will execute the mini project.
e. A detailed instructional manual will be provided to all teachers and students regarding its step by step execution.

List of Experiments:

1. Study of Resistors(All types and their applications)
2. Study of Capacitors (All types and their applications)
3. Study of Inductors (All types and their applications)
4. Study of Diodes-(All types and their applications)
5. Study of Transistors/ MOSFETs/IGBTs
6. PCB Designing on software
7. Study of Photodiodes/Phototransistor
8. Study of Optocoupler
9. Study of Solar Cell

10. Study of Sensors/Encoders/Accelerometer
11. Study of Actuators
12. Study of All kinds of motors like DC motor/Induction motors.
13. Study of Stepper Motors and their drives.
14. One mini Project on above experiential learning.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.E. ELECTRONICS / ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING

SYLLABUS

B.E. FOURTH SEMESTER

MICROCONTROLLER AND APPLICATIONS

Subject Code: BEETC-401T/BEEN-401T/BEEC-401T Credits: 04
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week
Tutorial: 1 Hours / Week
Examination Scheme T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam. : 03 Hrs

Course Objectives: -

1. To study and understand architecture of microcontrollers and its programming concept.
2. To understand the interrupt mechanism, PPI and I/O devices interfacing and its programming.
3. To study and impart different programming languages & tools for design of embedded systems.
4. To gain knowledge about advanced processors/controllers like ARM, PIC, MSP-430 etc.
5. To learn about Arduino platform for designing embedded system applications.

Course Outcomes: -

Upon completion of this course, students will demonstrate the ability to:

C01: Demonstrate the programming model of various microcontrollers.

C02: Design and implement 8051 microcontroller-based systems for various applications

C03: Illustrate & program AVR / RISC microcontrollers in Integrated Development environment.

C04: Design and implement advanced processor/controllers-based systems for various applications

C05: Design and develop Arduino based embedded system applications.

Course Contents:

UNIT I: INTRODUCTION TO MICROCONTROLLERS: (14 Marks)

Overview of MC-51 family, Architecture and Programming Model of 8051, Instruction Set, Assembly Language Programming, Stack, Interrupt , Timers, Serial Communication, SFRs, PPI and Port Programming.

UNIT II: APPLICATIONS OF 8051 MICROCONTROLLER(14Marks)

Interfacing and Programming of - Memory, LED / LCD Display, Keyboard, Stepper & DC Motor, A/D and D/A. Introduction to CAN, Bluetooth and USB protocols and its interfacing, Water Level Controller

UNIT III: INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) FOR MICROCONTROLLERS(14 Marks)

Editor, linker, Loader, Debugger, Simulator and Emulator. Instruction Set and Formats, Assembler Directives, Addressing Modes of AVR Microcontroller. Basic programming using AVR assembly instructions. Introduction to Embedded- C, Integrated Development Environment (IDE), cross compiler, ISP, simple program for delay generation.

UNIT IV: INTRODUCTION TO OTHER ADVANCED MICROCONTROLLERS (14 Marks)

Introduction to ARM and PIC Processors of MSP 430 Microcontroller, 16 bit Micro-controllers overview; features, Architecture, Addressing Modes. Low power feature of MSP 430.

UNIT V: INTRODUCTION TO ARDUINO: (14Marks)

Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Introduction to Embedded C and Arduino platform.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List:

1. LCD - MCU interfacing and displaying a string
2. MCU interfacing take a input from keypad and display on LCD
3. Stepper Motor Control Using ATMEGA-16 Microcontroller
4. Interface a LED matrix and display a number on the matrix.
5. Interfacing 4x4 switch matrix with the microcontroller
6. Implementation of Digital FIR Filter on 8051 Microcontroller
7. Serial Communication between micro controller and PC
8. Temperature control using ATmega16
9. Study hardware and software platforms for DCS
10. Simulate analog and digital function blocks

11. Study, understand and perform experiments on timers and counters
12. Logic implementation for traffic Control Application
13. Logic implementation for Bottle Filling Application
14. Tune PID controller for heat exchanger using DCS
15. FBD for autoclavable laboratory fermenter
16. Develop graphical user interface for the fermenter plant

Web links:

1. http://vlabs.iitkgp.ernet.in/rtes/index.html#
2. http://ial-coep.vlabs.ac.in/List%20of%20experiments.html

Text Books

1. The AVR Microcontroller and Embedded Systems: A System Approach by Muhammad A. Mazidi, 1st Ed., PHI, 2013.
2. Kenneth J. Ayala, "The 8051 Microcontroller", Penram International Publishing, 1996.
3. Embedded C Programming and the ATMEL AVR by R H Barnett 2nd Ed., Cengage Learning Publication, 2006.

Reference Books:

1. The 8051 Microcontroller: A System Approach by Muhammad Mazidi, 1st Ed., PHI, 2012
2. D. M Calcutt, Fredrick J. Cowan " 8051 microcontroller: an application based introduction".
3. SubrataGhoshal "8051 microcontroller" Pearson Education

B.E. FOURTH SEMESTER

MICROCONTROLLER AND APPLICATIONSLAB

Subject Code: BEETC-401P/BEEN-401P/BEEC-401P Credits: 01
Teaching Scheme Practicals: 2 Hours/ Week
Examination Scheme P (U): 25 Marks, P (I): 25 Marks

Course Objectives:

The course objectives are:

1. To perform a practical based on different microcontroller based systems.
2. To study assembly language programming skills.
3. Interface different peripherals with microcontrollers forits practical use.

Course Outcomes:

After the completion of practicals, the students will be able to:

CO1: Demonstrate the concept of Assembly languages and higher level language programming.

CO2: Interface various peripherals with 8051,Atmega 32, MSP 430 and Arduino.

CO3: Simulate the programs on different software platforms.

Instructions-

1. Minimum 9 experiments including one mini project needs to be conducted
2. Conduct at least 2 experiments on general assembly language programming of microcontroller 8051
3. Conduct at least 1 experiment on interfacing based circuits using microcontroller 8051
4. Conduct at least 2 experiments on AVR Atmega 32 microcontroller
5. Conduct at least 2 experiments on MSP 430 microcontroller
6. Conduct at least 1 experiments on Arduino microcontroller
7. One miniproject needs to be compulsorily developed using any microcontroller on etched PCB

List of Experiments

1. Write and execute ALP for 8051 to convert two digit decimal numbers present in external data memory into its equivalent ASCII code.
2. Write and execute ALP for 8051 to swap nibbles of 10 bytes present in external data memory.
3. Write an ALP for 8051 to finding the smallest and largest number from given data bytes stored in internal/external data memory location
4. Write and execute ALP for 8051 to exchange two data strings present in external data memory.
5. Write and execute an ALP for 8051 to exchange the data of two memory location.
6. Write and execute ALP for 8051 to convert two digit decimal number present in external data memory into its equivalent ASCII code.
7. Write a 8051 assembly language program to copy a data from DATA space(internal Ram) into the EXTERNAL memory space starting at address 8000H.

8. Assume that 5 BCD data items are stored in RAM locations starting at 40H. Write a 8051 assembly language program to find the sum of all the numbers. The result must be in BCD.
9. Write a 8051 assembly language program to find largest no. of given 10 bytes of data stored in memory location 5000H
10. MCU 8051 Timer interrupt programming using Timer0 model for blinking LED using interrupt
11. Interface 8 LEDs with 8051 and write a program to glow alternate LEDs. Modify the experiment further to blink an LED lamp of 230V AC/10W with an on and off time of 1 Second
12. Interface microcontroller 8051 with LCD display and display a string of "Welcome to microcontroller Programming" and a table of 5
13. Design an interfacing of seven segment display with microcontroller 8051 and generate all numbers from 0 to 9 with time duration of 1 second.
14. Interface Microcontroller 8051 with DAC and generation of triangular wave of frequency 10kHz triggering through timer (on chip timer)
15. Design a Stepper Motor Controller Using 8051 Microcontroller. Rotate this motor with an RPM of 150 both in clockwise and anticlockwise directions
16. Design an MCU AVR Atmega32 interfacing with LCD and displaying string and table of 5. Modify this program to interface LM 34 for displaying temperature in Degree Centigrade and Fahrenheit on LCD display.
17. Write and execute ALP for AVR Atmega32 to generate square wave of 1kHzs frequency on any one of the pin of output port. Modify this experiment further to generate pulses of different duty ratios starting from 10% to 90 %.
18. Interface stepper motor with AVR Atmega 32 microcontroller and write a program to rotate in clockwise and anticlockwise direction at a speed of 150 RPMs
19. Design a water level controller using AVR Atmega 32 in a) timer mode of operation and sensor mode of operation(I/O programming)
20. Design an interfacing of alphanumeric display with AVR Atmega 32 and generate all numbers from 0 to 9 and all letters from A to Z with a time duration of 1 second.
21. Establish Serial Communication between two MSP 430 microcontrollers
22. Write a program to interface an LED to the port 2 of MSP 430 microcontroller. Use both conditions of active low and active high in program.
23. Write a program to generate PWM pulses of 1kHz using MSP 430 microcontroller at a varying duty cycle of 10 % to 90 %.
24. Interface MSP 430 microcontroller with a matrix keyboard and display different characters on LCD
25. Using Arduino interrupt programming concept, interface a push button switch with it and switch on and off an LED lamp of 230V AC/10 W.
26. Design a PWM speed control system of 12V DC motor using Arduinoand run it at a speed of 10 % to 100%..
27. Write a program to generate saw tooth waveform of frequency 1kHz with Arduino.
28. Design a traffic light controller using Arduino in timer mode for four roads. Use 3 LEDs, Red, Green and Yellow in each direction.

B.E. FOURTH SEMESTER

ANALOG AND DIGITAL COMMUNICATION

Subject Code: BEETC-402T/BEEN-402T/BEEN-402T Credits 04
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week
Examination Scheme T (U): 70 Marks, T (I): 30 Marks
Tutorial: 1 Hours / Week
Duration of University Exam. : 03 Hrs

Course Objectives: -

The objective of this course is to provide students with understanding of

1. The basic principles and techniques used in analog and digital communications.
2. Analog and digital modulation techniques, communication receiver and transmitter design, baseband and band pass communication techniques, line coding techniques, noise analysis, and multiplexing techniques.
3. Analytical techniques to evaluate the performance of communication systems.

Course Outcomes: -

Upon completion of this course, students will demonstrate the ability to:

CO1: Demonstrate a basic need of modulation and various types of amplitude and angle modulation techniques required for analog communication.

CO2: Analyze various AM-FM receivers, along with the effect of noise on analog communication systems.

CO3: Explain the designing of digital communication systems by applying knowledge of the various pulse modulation techniques.

CO4: Describe various digital modulation techniques and various parameters associated withit.

CO5: Identify different types of channel coding techniques and analyze the different spread spectrum methods.

UNIT I: AMPLITUDE MODULATION: (14Marks)

Need for modulation, Amplitude Modulation (AM), DSBSC, SSB, VSB and ISB transmissions, mathematical Analysis, modulation index, frequency spectrum, power requirement of these systems, AM Generation: Generation of DSBFC - Plate Modulated Class-C Amplifier.Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Generation of FM (Direct & Indirect Method), Comparison of FM and PM. Pre-emphasis and De-emphasis.

UNIT II: AM & FM RECEIVERS: **(14Marks)**

AM Detection: Demodulation of DSBFC – Square Law Detector, Envelope Detector, Demodulation of DSBSC - Synchronous Detector, Demodulation of SSBSC. FM Receivers: Super-heterodyne Receiver: Block Diagram, Performance Characteristics - Sensitivity, Selectivity, Fidelity, Foster Seeley FM Discriminator .Types of Noises. Signal to Noise Ratio. Noise Figure.

UNIT III: DIGITAL COMMUNICATION :**(14Marks)**

Sampling theorem, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Analog modulation: PAM PWM & PPM.
PCM – Generation & reconstruction, Bandwidth requirement of PCM. Differential PCM, Delta Modulation & Adaptive DM. Companding in PCM.

UNIT IV: DIGITAL MODULATION TECHNIQUES: **(14Marks)**
Introduction to Digital Modulation Techniques ASK , PSK, FSK,QPSK, MSK, DPSK, OFDM. Introduction to information theory, channel capacity, Huffman, Prefix code, and LZ encoding algorithm. Rate distortion theory for optimum quantization, scalar and vector quantization.

UNIT V: REVIEW OF CHANNEL CODING AND SPREAD SPECTRUM: **(14Marks)**
Linear block codes, cyclic codes convolution encoding and decoding,Viterbi algorithm and Fano algorithm. Trellis coded modulation methods. Study of PN sequences, direct sequence methods, slow and fast Frequency hop methods. Application of spread spectrum, CDMA.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers
4. At least 10 activities to be conducted in every course in classroom
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. To calculate modulation index by observation of AM wave
2. To study quantization
3. To study sampling theorem
4. To perform Lempel-Ziv encoding and decoding.
5. To perform convolution encoding and decoding.
6. Simulation of a Satellite Network

   Satellite | Simulating a Satellite network in ns2 | Geostationary satellite nodes | Terminal nodes | Polar orbiting satellite nodes(Non-geostationary satellite) | Satellite links | Handoffs | Routing | Structure of trace files in Satellite network

7. Simulating a Wi-Fi Network

   Wi-Fi Networks | IEEE 802.11 Standards | Hardware Requirements for Wi-Fi | How to connect to the Wi-Fi Networks? | Advantages of Wi-Fi | Limitations | MAC Protocols | Use of RTS/CTS to Exchange Data | Issues in Wi-Fi Networks | The Hidden Terminal Problem | Solution of Hidden Terminal Problem | Exposed Terminal Problem | Solution to the Exposed Terminal Problem | Simulating a Wi-Fi using Network Simulator 3
8. Simulating a Wireless Sensor Network

Wireless Sensor Networks | Basic Characteristics of WSNs | Operating Systems for WSNs | Differences with Mobile Ad hoc Networks | Types of Wireless Sensor Networks | Routing protocols for WSNs | Clusters and Cluster heads in WSNs | The LEACH Protocol | Operation of LEACH | Discussions on LEACH | Applications of WSNs | Simulating a WSN using Network Simulator 2

9. Setting up a Bluetooth Network

   Bluetooth Network | Who started Bluetooth ? | Bluetooth vs Wi-Fi | Bluetooth – Power Classes | Bluetooth - Versions | How does Bluetooth work ? | Networking of Bluetooth | How to connect Bluetooth ? | Simulating Bluetooth Network with NS-2

10. Setting up a ZigBee Network

    ZigBee Network | IEEE 802.15.4 and ZigBee | ZigBee vs. Bluetooth | Features & Characteristic of ZigBee Technology | Application of ZigBee Technology | Component of IEEE 802.15.4 LR-WPAN | Network Topologies | ZigBee Architecture | The Superframe structure | Nodes Configuration | Energy Model

Web links:

1. https://vlab.amrita.edu/index.php?sub=59&brch=163
2. http://vlabs.iitkgp.ac.in/ant/

Text Books

1. Communication Systems - B.P Lathi, BS Publication
2. Lathi B.P. - Modern Digital and Analog communications systems - PRISM Indian Ed.
3. Simon Haykin, “Digital Communication Systems”,JohnWiley&Sons,

Reference Books:

1. P Ramkrishna Rao, Digital Communication, McGraw-Hill Publication
2. J.G. Proakis, Digital Communication.
3. S. Haykin, Communication Systems
4. Leon W. Couch: Analog/Digital Communication, 5thEdition, PHI,2008

B.E. FOURTH SEMESTER

Analog and Digital Electronics Lab

Subject Code: BEETC-403P/BEEN-403P /BEEC-403P Credits 01
Teaching Scheme Lectures: 2 Hours/ Week
Examination Scheme P (U): 25 Marks, P (I): 25 Marks

Course Objectives:

The course objectives are:

1. To impart practical concepts of different analog and digital electronics circuits
2. To understand the basic fundamentals of analog and digital circuits.

Course Outcomes:

After the completion of practical, the students will be able to:

CO1: Explain the practical aspects of linear and non-linear applications of OP-AMP.
CO2: Design the various wave-shaping circuits, oscillators, signal conditioners and various application based circuits using OP-AMP and Transistors
CO3: Demonstrate various concepts of analog communication
CO4: Explain various concepts of digital communication.
CO5: Develop an application based project using industry based OPAMP

Instructions:-

1. Minimum 9 practicals including miniproject (3 from Analog Electronics Section, 2 from Analog Communication category, 3 from digital communication category)
2. One mini project to be developed with simulation and hardware on a general purpose or etched PCB. Use OPAMPs popularly used in Industry such LM324, LM 2902, LM 358, MC3403. A communication based miniproject can also be developed.
3. Perform Simulation of all experiments using any open-source or licensed software.

List of Experiments:
Analog Electronics

1. To use OPAMP for switching on and off a 230 V AC bulb of min 20W by designing necessary circuit
2. To use OPAMP for speed control of a 5V DC motor
3. To use OPAMP as an amplifier for amplifying thermocouple voltage to proportionate 12V DC
4. To use OPAMP as a current to voltage converter for amplifying solar cell signal
5. To use OPAMP as a voltage to current converter for converting 0-10V Dc to 4-20 mA DC
6. To use OPAMP as a triangular wave generator of frequency 5kHz
7. Use of OPAMP as PWM wave generator for frequency 10kHz and varying duty ration of 10% to 90 %
8. Use of OPAMP to generate switching pulses for a Power BJT with 15V DC

9. To use OPAMP as a digital latch with single switch and two switches and use it to for switching of a 230V/10 W LED bulb
10. To design load cell amplifier using concept of instrumentation amplifier and associated noise handling circuit
11. Design of an RTD amplifier and calibrate its gain with zero offset adjustment
12. To study and Design of a Voltage to frequency converter with linearity
13. To study and Design of a frequency to voltage converter with linearity
14. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
15. To design OP-AMP as Precision Half wave rectifier and plot the waveforms.
16. Design and verify Multivibrator circuits using IC 555 and generate switching pulses of 1kHz at different duty ratios for SMPS switching application
17. Design RC oscillator/ transistorized LC oscillator using OP-AMP and calculate its frequency.
18. Design first & second order low pass Butterworth filer with a cutoff frequency of 1kHz.
19. Design of series voltage regulators of 12V/5V DC with a current capacity of 500mA

Analog Communication for Mini Project

1. To calculate modulation index by observation of AM wave
2. To study quantization.
3. To study sampling theorem
4. To study companding
5. To study DSBSC transmitter and receiver.
6. To study time division multiplexing
7. To study Frequency modulation and compute the modulation index
8. To study FM generation using MATLAB
9. To study AM generation using MATLAB.

Digital Communication for Mini Project

1. To write SCILAB code for BASK modulation/demodulation.
2. To write SCILAB code for BFSK modulation/demodulation.
3. To write SCILAB code for BPSK modulation/demodulation.
4. To generate a Differential Binary Phase Shift Keying signal using PSK modulator and detect the message signal from DBPSK signal using PSK demodulator using SIMTEL.
5. To generate a Minimum Shift Keying signal and detect the message signal from MSK signal using SIMTEL.
6. Open Problem Statement 1: Prepare/Analyze any Digital Communication System /Any other system using XCOS.
7. To perform Lempel-Ziv encoding and decoding.
8. To perform convolution encoding and decoding.
9. To perform OFDM Transmission and Reception.
10. To perform CDMA-DSSS Transmission and Reception.

Some examples are of Mini projects are as follows

1. A Variable Audio Frequency Oscillator Using Op-amp
2. Adjustable Ripple-Regulated Power Supply Using OPAMP
3. Automatic Fence Lighting with Alarm
4. Auto-cut for Manual Stabilizers using IC

5. Automatic Light Operated Switch Using LDR and OPAMP
6. Bass Booster Using Op-amp
7. Battery Voltage State Indicator using
8. DC Volt Polarity Indicator Using IC
9. DIY Headphone Amplifier
10. Dual Trace Generator Circuit
11. Electronic Room Thermometer Using Op-amp
12. Four Channel Audio Mixture
13. High/Low Voltage Cut-out Using Op-Amp
14. Laser Based Communication Link
15. Light Sensor Switch Circuit using LDR
16. Listening Bug Using op-amp
17. Microphone Amplifier Using Op-amp
18. Operational Amplifier Tester
19. Sound Operated Intruder Alarm with Flash
20. Sort Circuit Protected Regulated Power Supply Using
21. Steam Whistle Circuit using IC
22. Temperature Deviation Indicator Using
23. Thermal Touch Switch Using Op-amp
24. Tone Control for Guitar Amplifier Using
25. Voltage into Frequency Converter
26. Wind Sound Generator Using IC
27. Sound detector circuit using op-amp
28. Electronic Fuse using OP-amp

B.E. FOURTH SEMESTER

ANALOG SYSTEM DESIGN

Subject Code: BEETC-404T/BEEN-404T/BEEC-404T Credits 04
Teaching Scheme Lectures (including activity based learning):3 Hours/ Week
Examination Scheme T (U): 70 Marks, T (I): 30 Marks
Tutorial: 1 Hour / Week
Duration of University Exam. : 03 Hrs

Course Objectives:

1. To understand characteristics of various Analog Circuits.
2. To study and interpret the datasheet.
3. To design and analyze linear and nonlinear applications of Op-Amp.
4. To design DC regulated power supply.
5. To design RC & LC oscillators.
6. To design RC Filters and drivers.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1: Describe and explain the basic concepts of OPAMP.

CO2: Demonstrate and analyze various linear applications of OPAMP

CO3: Demonstrate and analyze various non-linear applications of OPAMP

CO4: Examine and design DC Power Supply.

CO5: Examine and design various types of oscillators and filters.

Course Contents:

UNIT-1: INTRODUCTION TO OPERATIONAL AMPLIFIER (14Marks)
Op-Amp Fundamentals: Block diagram of operational amplifier, Differential amplifiers using transistors. Op-Amp parameters, virtual ground concept, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting & non inverting configurations.

UNIT-II: OP-AMP LINEAR APPLICATIONS (14 Marks)
Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators, current to voltage converters, voltage to current converters, Peak detector, Log and antilog amplifiers and analog multipliers.

UNIT-III: OP-AMP NON LINEAR APPLICATIONS (14Marks)
Comparators, Schmitt trigger, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable using Op-Amp, Sample/Hold circuits, 555 Timer and its applications, Phase lock loops.

UNIT-IV: DESIGN OF DC POWER SUPPLY (14Marks)
Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78×× and 79××, protection circuitsfor regulators, Design of SMPS (Buck & Boost)

UNIT-V: DESIGN OF SINUSOIDAL OSCILLATORS, FUNCTION GENERATOR and FILTERS (14 Marks)

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley &Colpitts oscillator, Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of Butterworth Active Filters LPF, HPF, BPF, BRF etc,

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1. All Experiments are from Virtual Labs
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers
4. At least 10 activities to be conducted in every course in classroom
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

Suggested List

1. Log and antilog amplifiers
2. Voltage comparator
3. Wien bridge oscillator using operational amplifier
4. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA
5. Voltage to current converters
6. Function generator using operational amplifier (sine, triangular & square wave)
7. Astable and monostablemultivibrator using IC 555
8. Study of basic properties of Operational Amplifier: Inverting and Non-Inverting Amplifiers
9. Study of Differentiator and Integrator using Operational Amplifier**
10. Non linear circuits using OPAMPs
11. Active filters

Web links:

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/analog-electronics/experimentlist.html
2. http://vlabs.iitkgp.ernet.in/be/index.html#
3. https://ee-iitb.vlabs.ac.in/index.html

Text Books:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.
4. N. C. Goyal and Khetan 'A Monograph on Electronics Design Principals', Khanna Publications
5. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill.

Reference Books:

1. Linear Integrated Circuits Manual I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Regulated Power supply Handbook. Texas Instruments.
4. Electronics: BJT's, FETS and Microcircuits – Anielo.
5. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

B.E. FOURTH SEMESTER

DATA STRUCTURE & ALGORITHMS

Subject Code: BEETC-405T/BEEN-405T/BEEC-405T Credits:03
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week
Examination Scheme: T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam. : 03 Hrs

Course Objectives:

1. To make students understand efficient storage structures of data for an easy access.
2. To teach the difference between linear &non linear data structures and its respective benefits
3. To design and implement various data structures.
4. To develop application using data structures and algorithm and analysis.
5. To improve the problem solving efficiency.

Course Outcomes:

1. Student will be able to choose appropriate data structure based on the specified problem definition and analysis the algorithm.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like Operating Systems, DBMS etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues, linked list, trees etc.

Course Contents:

UNIT I: Data Structures (7Marks)

Introduction to Data Structures, Need of Data Structure, Abstract Data type, Types of Data StructuresAlgorithms: Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations (Big O, Omega Ω, Theta θ), Time-Space trade-off.Searching- Linear & Binary Search, Sorting- Bubble Sort, Insertion Sort, Selection Sort, Algorithm design strategies - Divide and Conquer strategy, Merge Sort, Quick Sort, complexity analysis of sorting methods.

UNIT II: Abstract Data Types (ADTs) Arrays (8 Marks)

Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays
Stacks- Introduction, PUSH and POP operations on Stacks, Prefix, Infix & Postfix expressions- Conversion and Evaluation, Multiple Stacks.
Queues- Introduction, Insertion & deletion in Queues, Circular Queues, Priority Queues.

UNIT III: Linked List- Linked List as ADT (7Marks)

Dynamic Memory Allocation Functions, Types of Linked Lists- (single, double, circular), Operations on Linked Lists- (create, insert, delete, reverse etc.), Applications of Linked List- Polynomial Representation (Addition/deletion/multiplication of two polynomials). Trees- Introduction, Implementation of Trees, Tree Traversals with an Application, Binary Trees, BST- Insertion & Deletion, Expression Trees, AVL Trees, Heap Trees.

UNIT IV: Graphs (7 Marks)

Graphs- Data Structures for Graphs, Graph Traversals Directed Graphs, Graph Storage Structures (Adjacency Matrix, Adjacency List) Weighted Graphs, Shortest Paths, and Minimum spanning Trees. Applications of DFS and BFS.
HASING TECHNIQUES
Symbol Tables: static tree tables, dynamic tree tables, hash tables, hash functions, Collision resolution, overflow handling, Applications

UNIT V: ALGORITHMS (7Marks)

Advanced algorithms based on the data structures. Shortest-Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge Costs, Acyclic Graphs, Network Flow Problems, Matrix Chain Multiplication, Longest Common Subsequence, Optimal Binary Search Tree, Backtracking strategy - 4 queens problem, Hamiltonian Path.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1) All Experiments are from Virtual Labs
2) At least 1 experiment activity should be conducted from every unit.
3) Some additional simulation based activities feasible to be executed in classrooms can be added by the course teachers
4) At least 10 activities to be conducted in every course in classroom
5) Course faculty is permitted to use any other open source or licensed platform in classroom.
6) Course faculty can add any other activity as per the feasibility in classroom based teaching learning process.

Suggested List:

1. Number Systems

2. Expression Evaluation using Stacks
3. Sorting using Arrays
4. Polynomials via Linked Lists
5. Search Trees
6. Expression Trees
7. Graph Traversals
8. Shortest Paths in Graphs
9. Minimum Spanning Trees
10. Bubble Sort
11. Merge Sort
12. Heap Sort
13. Quick Sort
14. Depth First Search
15. Breadth First Search
16. Tree Traversal
17. Binary Search Trees
18. Stacks and Queues
19. Infix to Postfix
20. Unsorted Arrays
21. Hashtables
22. Linked lists
23. Polynomial Arithmetic using linked lists
24. Selection Sort
25. Radix Sort
26. Topological Sort
27. Minimum Spanning Trees
28. Path algorithms: Dijkstra's shortest path
29. 2-3 Tree
30. Red Black Tree
31. Tries and Suffix Trees
32. Substring search: KMP algorithm

Text books:

1. Data Structures with C, Seymour Lipschutz, Schaums Outlines, Tata McGraw Hill Education.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni,Galgotia Pub. 2001 ed.
3. Data Structures using C and C++ by Y. Langsam, Pearson Education.
4. Data Structures using C by Tanenbaum, Pearson Education
5. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson

Reference books:

1. Data Structures and program design in C by Robert Kruse, Bruce Leung & Clovis Tondo.
2. Data Structures: A Pseudocode Approach with C by Richard F. Gilberg and BehrouForouzan.
3. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni,Computer Science Press.
4. Introduction to Algorithms, by Thomas Corman III edition, PHI

5. Analysis and Design of Algorithms: A Beginner's Approach, by Rajesh K. Shukla, Willey Publications
6. “Algorithms, Data Structuresand Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.

B.E. FOURTH SEMESTER

Numerical Mathematics and Probability Using MATLAB

Subject Code: BEETC-406T/BEEN-406T/BEEC-406T Credits 03
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week
Examination Scheme: T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam. : 02Hrs

Course Objectives:

1. A primary objective is to introduce and develop advanced mathematical skills of students that are imperative for effective understanding of engineering subjects.

2. The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.

Course Outcomes:

After completing the course, students will be able to

1. Learn and use MATLAB effectively in various applications as a simulation tool.

2. Find an approximate solution of algebraic and transcendental equations, system of linear equations and first order ordinary differential equations by various numerical methods and MATLAB commands.

3. Apply Z- transform to solve difference equations with constant coefficients.

4. Analyze real world scenarios to recognize when probability is appropriate, formulate problems about the scenarios; creatively model these in order to solve the problems using multiple approaches

5. Understand the impact of scientific and engineering solutions in a global and societal context.

6. Create the groundwork for post-graduate courses, specialized study, and research in mathematics.

Course Contents

Unit I: INTRODUCTION TO MATLAB (14 Hours)

Introduction, What is MATLAB?, The MATLAB system, MATLAB documentation, Starting and quitting MATLAB, MATLAB desktop matrices, array matrices and magic squares, MATLAB Expressions, Controlling command window input and output, Graphics overview of MATLAB plotting, Types of functions.

Unit II: NUMERICAL METHODS - I (14 Hours)

Error Analysis, Solution of Algebraic and Transcendental Equations: Method of False position, Newton–Raphson method and its convergence, Basic MATLAB command “fzero” to find real roots of $f(x) = 0$. Solution of system of simultaneous linear equations: Crout’s method (LU decomposition Method), Gauss-Seidel method, MATLAB Built-in function for LU and Gauss-Seidel method.

Unit III: NUMERICAL METHODS - II (14 Hours)

Numerical solution of ordinary differential equations: Taylor's series method, Euler's modified method, Runge- Kutta 4th order method, Milne's predictor corrector method, RungeKutta method to solve simultaneous first order differential equations, Introduction of MATLAB commands for solving ordinary differential equations.

Unit IV: Z-TRANSFORM (14 Hours)

Definition, Convergence of Z-transform and properties (Statement only), Inverse Z-transform by partial fraction method, Residue method (Inversion integral method), Convolution of two sequences, Solution of difference equations with constant coefficients by Z-transform, Use of MATLAB commands ztrans(f), ztrans(f, transVar), ztrans(f, var, transVar).

Unit V: PROBABILITY (14 Hours)

Review of discrete and continuous random variables, Mathematical expectation, Variance and Standard deviation, Moments, Moment generating function, Skewness and Kurtosis, Binomial distribution, Poisson distribution, Normal distribution, Exponential distribution, Use of MATLAB functions for numerical solution of special probability distributions.

Text/Reference Books:

(1) Applied Numerical Methods Using MATLAB (Wiley), Won Y. Yang, Wenwu Cao, Jaekwon Kim, Kyung W. Park, Ho-Hyun Park, JingonJoung, Jong-Suk Ro, Han L. Lee, Cheol-Ho Hong, TaehoIm.

(2) Numerical Methods Using MATLAB (PHI), John H. Mathews, Kurtis D. Fink.

(3) Numerical Methods for Engineers and Scientists (An introduction with Applications Using MATLAB) (WILEY), Amos Gilat, Vish Subramanian.

(4) Higher Engineering Mathematics (Khanna Publications), B. S. Grewal.

(5) Advanced Engineering Mathematics (Wiley), Erwin Kreyszig.

(6) Advanced Engineering Mathematics (S. Chand), H. K. Dass. (7) Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan

B.E. FOURTH SEMESTER

Programming for Problem Solving

Subject Code: BEETC-407T/BEEN-407T/BEEC-407T Credits 02
Teaching Scheme Lectures(including activity based learning): 2 Hours/ Week
Examination Scheme: T (U): 35 Marks, T (I): 15 Marks
Duration of University Exam. : 02Hrs

Course Objectives

1. To understand the basic concepts of Object Oriented Programming.
2. To implement the concepts of Inheritance in Problem solving.
3. To apply the concepts of Polymorphism and Interfaces.
4. To implement the concepts of Exception Handling
5. To design and implement program using file system.

Course Outcomes

1. Student will be able to understand the basic concepts of Object Oriented Programming and design simple java programs.
2. Student will be able to apply the knowledge of Inheritance in program development.
3. Student will able to develop programs using polymorphism and interfaces.
4. Student will be able to handle various exceptions using concepts of exception handling.
5. Student will able to use multithreading concepts to develop inter process communication.
6. Student will be able to understand and implement concepts on file streams and operations in java programming for a given application programs.

Course Contents

Unit-1 Introduction (4Hrs)

Introduction: Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue, Methods.

Unit 2: Classes and Objects (5Marks)

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.

Unit 3: Inheritance and Polymorphism (5Marks)

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding, Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords.
Polymorphism: dynamic binding, method overriding, abstract classes and methods;

Unit-4: Interfaces and Packages (5Marks)

Interface: Interfaces vs. Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

Packages: Defining, creating and accessing a package, understanding Class path, importing packages.

Unit-5: Exception Handling and I/O Streams (5 Marks)
Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, GUI components in Java, Introduction to Database Connectivity.
I/O Streams: Concepts of I/O streams, Reading console Input and Writing Console output, File Handling.

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

Activity Based Learning

Instructions for Activity Based Learning

1) All Experiments are from Virtual Labs
2) At least 1 experiment activity should be conducted from every unit.
3) Some additional simulation based activities feasible to be executed in classrooms can be added by the course teachers
4) At least 10 activities to be conducted in every course in classroom
5) Course faculty is permitted to use any other open source or licensed platform in classroom.
6) Course faculty can add any other activity as per the feasibility in classroom based teaching learning process.

Suggested List:

1. Accessing Instance and Variables
2. Parameterized Constructors
3. Reference Datatypes
4. Static variables
5. Enhanced Loop in Java
6. Concatenating Strings
7. String Methods
8. Foreach loop
9. Call by value
10. Method Overloading
11. Command Line Arguments
12. Reading and Writing Files
13. Directories in Java
14. Exception Hierarchy

15. Multiple Catch Blocks
16. Finally Block
17. extends keyword
18. super keyword
19. Abstract class and methods
20. Implementing and Extending Interfaces
21. import keyword
22. Creating Packages

Text books:

1. Herbert Scheldt, “Java the complete reference”, McGraw Hill, Osborne, 7th Edition, 2011.

Reference Books:

1. T. Budd, “Understanding Object- Oriented Programming with Java”, Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

B.E. FOURTH SEMESTER

Programming for problem solving Lab

Subject Code: BEETC-407P/BEEN-407P/BEEC-407P Credits 02
Teaching Scheme Lectures: 4 Hours/ Week
Examination Scheme T (U): 25 Marks, T (I): 25 Marks

Course Objectives:

The course objectives are:

1. To understand the basic concepts of Object Oriented Programming.
2. To implement the concepts of Inheritance in Problem solving.
3. To apply the concepts of Polymorphism and Interfaces.
4. To implement the concepts of Exception Handling
5. To design and implement various data structures.
6. To develop application using data structures and algorithm and analysis.

Course Outcomes:

After the completion of practicals, the students will be

1. Able to choose appropriate data structure based on the specified problemdefinition and analysis the algorithm.
2. Able to handle operations like searching, insertion, deletionand traversingmechanism etc. on various data structures.
3. Apply the knowledge of Inheritance in program development.
4. Develop programs using polymorphism and interfaces.
5. Handle various exceptions using concepts of exception handling.

List of Experiments:

1,2. Practicals based on Introduction to Problem Solving
3. Practicals based on classes and objects
4. Practicals based on Inheritance
5,6. Practicals based on Polymorphism
7. Practicals based on Exception Handling
8,9. Practicals based on IO streams and File handling.
10.Practicals based on Stacks & Queues using Arrays
11. Practicals based on Linked Lists
12. Practicals based on Stacks & Queues using Linked Lists
13. Practicals based on Binary Search Trees
14. Practicals based on Graphs
15.Practicals based on Spanning trees

RashtrasantTukadoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E IVthsem (ETC/ECE/EN)

Subject: Universal Human Values (Theory)

CREDITS: 03

Teaching Scheme: 3 Hours/Week:

Examination Scheme: University Assessment: 70 Marks
College Assessment: 30 Marks

Aim: To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature

Objective: The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration, about themselves(humanbeing), family,society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being,family,society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course outcomes: By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. Students would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Students would understand values in relationship.
4. Students would understand the role of a human being in ensuring harmony in society and nature.
5. Students would distinguish between ethical and unethical practices at work place and would contribute for making a value based society

Unit 1

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

(6 hours)

Unit 2

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body, Understanding Harmony of I with the body, Sanyam, Aspects of Sanyam, Types of Sanyam,

benefits and obstacles in the path of Sanyam, Swasthya, Aspects of Swasthya, Determinants of Swasthya, Ways to maintain Swasthya.

(8 hours)

Unit 3

Values in relationship (nine universal values in relationships), Understanding values in human-human relationship; Meaning of Justice, Elements of Justice, Understanding meaning of Trust; Elements, Types and Dimensions of Trust, Difference between intention and competence.

(6 hours)

Unit 4

The five dimensions of human endeavour, the holistic perception of harmony in existence, Understanding harmony in society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. (8 hours)

Unit 5

Basics for ethical human conduct, definitiveness in ethical human conduct, human rights violations and social disparities, value based life, Competence in professional ethics

(8 hours)

Text Book: Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,ExcelBooks, NewDelhi,2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
4. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Embedded System Design [L: 2 T:1 P:0]

Subject Code : BEETC-501T

Course Objectives:

1. To Understand the Requirements & Design issues of embedded systems design.
2. To study the architecture and Programming of ARM processor using Assembly & Embedded C language
3. To understand interfacing of various peripherals with ARM Processor.
4. To study the concept of Real Time Operating System for embedded system design.

Course Outcome: By the end of the course, the students shall be able to

1. To Describe and analyse the Requirements & Design issues of embedded systems design.
2. To apply the knowledge of architecture and Programming of for development of simple applications.
3. To Describe and Demonstrate the interfacing of various peripherals with ARM Processor.
4. To explain the concept of Real Time Operating System for embedded system design.

UNIT-I

The concept of embedded systems design:-

History, Definition, and Classification of Embedded System, Design Metric & Its optimization, Embedded System Design Challenges, Processor selection Criteria, Building blocks of typical Embedded System – Core Types, Memory Architecture , Memory & Its Types, Sensors & Actuators, Communication Interfaces and Other system components and software architecture, Design tradeoffs due to process compatibility, thermal considerations, recent trends in embedded systems.

UNIT-II

Technological aspects of embedded systems, Embedded microcontroller cores:-

Interrupt Service Mechanism, Context Switching, Device Drivers, Pin Configuration and Block Diagram of ARM7TDMI Microcontroller, Core of ARM7TDMI and Interrupt structure, Programming Model, Operating Modes, Exceptions and Interrupt Mechanism

UNIT-III

Interfacing with external systems:-

Instruction set and Programming of ARM7TDMI Microcontroller using Assembly & Embedded C, Interfacing of external devices like LED's, 7--segment display, Switches, Multiplexed Keyboard, Stepper motor, concept of Timers and Counters ARM7TDMI Microcontroller.

UNIT-IV

Interfacing of analog and digital blocks, Signal conditioning, digital signal processing. Sub-system interfacing:-

Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller, Applications based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive, I2C, LCD and GLCD display, GSM and GPS Module, SD Card using SPI, on-chip DAC for waveform generation

UNIT-V

Software aspects of embedded systems-I

Real time programming languages and operating systems for embedded systems:-

Kernel and its types, Architecture of the kernel, Functions of Kernel, introduction to RTOS and its features in details, ISR, Context Switching, Threads, Task scheduler, Types of Scheduling Algorithms with examples, Real time algorithms like Rate Monotonic Algorithm and earliest deadline first Algorithm.

Software aspects of embedded systems-II

Real time programming languages and operating systems for embedded systems:-

Resource Management and concepts of Semaphore, Mailbox, Message queues, Pipes, Events, Timers, Memory Management and Introduction to real time operating System µCos

Text/Reference Books:

1. Raj Kamal, "Embedded Systems ", TMH Publications.
2. Frank Vahid, "Embedded System Design", Wiley Publications, New edition 2001.
3. Sloss endrew & Dominic Symes, "ARM system Developers Guide", Morgan Kaufmann , 2004
4. Dr. K.V.K.K. Prasad , "Embedded / Real Time Systems", Dreamtech Publications
5. Steve Heath, "Embedded System Design", Neuwans Publications

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Embedded System Design Lab [L: 0 T:0 P:2]

Subject code : BEETC-501P

Course Objectives:

1. To familiar with RARM7 software & KITS.
2. To enhance the ability of logical thinking so that student will be design an algorithm and program

Course Outcome: By the end of the course, the students shall be able to

1. Apply the knowledge of Instruction skill for the Development of Simple and Complex Programs.
2. Apply the programming skill for the Development of Simple application.
3. Apply and Demonstrate the Concept of Interfacing for the Development of Embedded System.

Use Assembly & Embedded C Language for following Programs.

1. To study the ARM Development Board.
2. To Write & Demonstrate the program for addition, subtraction Multiplication & Division of 16 / 32 bit number.
3. To Write & Demonstrate the program to find largest / Smallest of a Ten data Words.
4. To Write & Demonstrate the program for arranging the multiple data in Ascending / Descending Order.
5. To Write & Demonstrate the program for the swapping of 16 / 32 bit data.
6. To Write & Demonstrate the program for factorial of a given number
7. To Write & Demonstrate the program for display of number from 11 to 99 on seven segment display.
8. To Write & Demonstrate the program for Binary to Gray & Gray to Binary Number Conversion.

Use Embedded C Language for following Programs

9. To Write and demonstrate the program for flashing of LEDS Using ARM DEVELOPMENT BOARD.
10. To Write and demonstrate the program for interfacing ADC and DAC Using ARM DEVELOPMENT BOARD.
11. To Write and demonstrate the program for interfacing of a stepper motor and Rotate it in clockwise & anti-clock wise direction with equal delay Using ARM DEVELOPMENT BOARD.
12. To Write and demonstrate the program for interfacing of real time clock and serial port Using ARM DEVELOPMENT BOARD.
13. To Write and demonstrate the program for interfacing LED and PWM Using ARM DEVELOPMENT BOARD.
14. To Write and demonstrate the program for sending SMS to any mobile number Using ARM DEVELOPMENT BOARD.
15. To Write and demonstrate the program for Interfacing of pen drive for writing the predefined file Using ARM DEVELOPMENT BOARD

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Electromagnetic Waves [L: 3 T:1 P:0]

Subject Code : BEETC-502T

Course Outcomes:

At the end of this course students will demonstrate the ability to :

1. Understand the different coordinate system & analyze theorem's of electric Field.
2. Understand magnetic fields, Apply the Maxwell's equations to solve problems in electromagnetic field theory.
3. Analyze the propagation of wave in different transmission media.
4. Understand and analyze various parameters and characteristics of the rectangular waveguide.
5. Understand principle of radiation and radiation characteristics of an antenna.

Unit I : Electric Field

Basics of Vectors, Coordinate system and concepts of differential surface and differential volume, Basics of Coulombs Law, Gauss Law, Divergence Theorem, Gradient, Curl,

Unit II : Magnetic Field & Maxwell's equations

Basics of Magnetic Field, Biot-Savart's Law, Amperes Circuital Law, Stokes Theorem, Maxwell's equations for Time constant fields and Time Varying fields.

Unit III : Electromagnetic Waves

Electromagnetic wave equation, Wave propagation in free space, perfect dielectric and perfect conductor, Skin effect, Poynting vector and Poynting theorem, Snell's Law, Brewster Angle,Total Internal Reflection.

Unit IV : Rectangular Waveguide

Basics of Waveguide and its types, Comparison of Rectangular waveguide with Transmission Lines, TE, TM and TEM Waves, Field equations for TE and TM waves through rectangular waveguide, Modes in rectangular waveguide, Various losses, Cut-off frequency and wavelength, Phase and Group velocities, Guide Wavelength, Wave impedances in waveguide.

Unit V : Radiation

Retarded potential, Radiation from the Hertz dipole and its field equations, Induction field, Radiation Field, Total power Radiated and equation of Radiation Resistance, Basics of antenna and antenna terminologies, Fundamentals of antenna arrays.

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005

2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India.

3. NarayanaRao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.

4. David Cheng, Electromagnetics, Prentice Hall.

5. William H. Hayt Jr.&John A. Buck, Engineering Electromagnetics,McGraw-Hill.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Digital Signal Processing [L: 3 T:0 P:0]

Subject Code : BEETC-503T

Course Objectives:

The objective of this course is to:-

1. Apply the principles of discrete-time signal analysis to perform various signal operations
2. Learn the Discrete time signal processing in z domain &Its relationship with other domain and it's analysis.
3. Learn Fourier Transform and Concepts of frequency domain analysis using different FFT architectures.
4. Learn design aspects of FIR digital filters.
5. Learn design aspects of IIR digital filters.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Analyze discrete time signals and system.

2.Process the signal in z domain for various discrete time systems.

3. Draw the structures of various discrete time systems in DFI, DFII, cascade and parallel form.
4. Apply discrete Fourier transform, its properties &Analyze the discrete time systems in frequency domain.
5. Understand the filter design techniques for IIR and FIR digital filters and will be able to determine parameters affecting its response.

Unit I: Introduction (10)

Sampling theorem, sampling process and reconstruction of sampling data.

Discrete time signals &systems : classification of discrete time signals and systems, LTI systems, linear convolution, Correlation

Multirate Digital Signal Processing-Down sampling, Up sampling, Sampling Rate Conversion

Unit II: Discrete Fourier Transforms

(09)

Frequency domain sampling: DFT/IDFT, Computation of DFT, Properties of DFT, Circular convolution, Computation of DFT using FFT algorithm – Decimation in time, Decimation in Frequency using radix 2 FFT – Butterfly structure.

Unit III:Realization of Digital Filters

(09)

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, Realization of digital filters - Direct, Canonic, Cascade and Parallel forms

Unit IV: IIR Filter Design (09)

Bilinear transformation, Impulse invariant transformation, Lowpass IIR digital filters, Butterworth and Chebyshev filter, Spectral transformations.

Unit V: FIR Filter Design (08)

FIR filter design using windowing techniques (Rectangular, Hann, Hamm, Blackmann, Bartlett and Kaiser), Frequency sampling technique

Text Books:

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, PHI.
2. A.V. Oppenheim, R.W. Schafer, "Discrete Time Signal Processing", PHI.
3. Rabiner Gold "Theory and Application of DSP", PHI
4. Texas Instruments and Analog Devices DSP Chip Manuals.

Reference books:

1. Digital signal processing- A practical approach Second Edition, 2002. **.E**. C. Ifeachar, B. W. Jarvis Pearson Education
2.Sanjit K. Mitra , 'Digital Signal Processing – A Computer based approach'
3. S. salivahanan, A Vallavaraj, C. Gnanapriya , 'Digital Signal Processing', 2nd Edition McGraw Hill.
4. A. NagoorKani, 'Digital Signal Processing', 2nd Edition McGraw Hill.
5.P. Ramesh Babu, 'Digital Signal Processing' Scitech

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Digital Signal Processing Lab [L: 0 T:0 P:2]

Subject Code : BEETC-503P

Objectives:

1. To understand the concept of Sampling and Aliasing effect & generation of different discrete time signal
2. To Learn to generate discrete time signals and to perform signal operations.
3.To understand the Z transform and discrete time Fourier transform for the analysis of digital signals and systems.
4. To Understand discrete Fourier transform and its properties.
5. To design and implement FIR & IIR filter and analysis of their frequency response
6. To understand the principle & working of digital signal processing for various applications.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate the sampling and reconstruction of discrete time signal & perform different signal operation in developing discrete time system.
2. Analyze different properties of Z-transform.
3. Analyze different properties of discrete Time Fourier transform.
4. Analyze and process the signals in the discrete domain.
5. Design the filters to suit requirements of specific applications.
6. Apply the techniques, skills, and modern engineering tools like MATLAB

Any TEN practicals are to be conducted

LIST OF EXPERIMENTS

1. To plot and represent following basic discrete time signals using MATLAB functions. : Unit impulse, unit step, ramp, real and complex exponential and its representations.

2. Sampling of Continuous time Signal. Reconstruction of Discrete time Signal and Illustration of Aliasing

3. To plot linear convolution of discrete signals using MATLAB functions.

4. Write a program to test stability of given discrete- time system.

5. To find Z transform of discrete time signal and its ROC with corresponding plot.

6. To find inverse Z transform of given discrete time signal.

7. Write a program to find frequency response of given system. (Transfer Function/ Differential equation form).

8. To compute DFT and IDFT of discrete time signals.

9. Write a program to find FFT and IFFT of given sequences.

10. Compute linear and circular convolution using DFT / IDFT method.

11. Designing of Digital IIR filter using MATLAB functions

12. Designing of Digital FIR filter using MATLAB functions

13. Designing of Digital FIR filter using GUI tool box.

14.Genefration of sinusoidal signal through filtering

15.Implementation of Decimation ,interpolation Process

Contents beyond syllabus

1. To Study DSP Processor using TMS 5416 and TMS 6713 starter kits.

2. To perform linear convolution and circular convolution on Processor kit.

3. Designing and implementation of High pass filter on DSP processor.

4. Generation of DTMF signals

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering
B.Tech.5 th Semester

Subject: INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP DEVELOPMENT.

Examination Scheme:

Units: 05.

Marks: Internal - 30
External - 70

Objective
Study of this subject provides an understanding of the scope of an industrial economics and entrepreneurship development, key areas of business development, sources of finance, project preparation, methods of taxation and tax benefits, significance of entrepreneurship and economic growth, application of engineering skills in entrepreneurial activities etc.

Course Outcomes:After completing the course, students will be able to:

CO1. Understand different types of business structure.

CO2. Acquire the knowledge of different market structures and New economic policy

CO3. Grasp the functions of banks, taxations system and implications of Inflation.

CO4. Identify various sources of finance

CO5. Analyse the problems of Small Scall Industries and government's policies for them.

1. Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

2. Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration- forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization, Business cycles, optimum size of firm.

3. The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Inflation, Recession, Inclusive growth, Public-Private partnership for development

4. Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Break Even Analysis, Taxation – Direct, Indirect Taxes.

5. Sickness in small Business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS

Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

Modern Economic Theory By, K.K. Dewett. S.Chand.

Industrial Economics. By, Jagdish Sheth, Pearson Publication.

"Entrepreneurial Development" By, S.S.KhankaS.Chand& Co. Ltd. Ram Nagar New Delhi, 1999.

Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.

Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.

Entrepreneurial Development. By, S.Anil Kumar. New Age International.

Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:

Business Economics. By, K.Rajgopalchar. Atalantic Publishers.

Microeconomics. By, Robert Pindyk

Business Economics.By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.

Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Operating system (Elective) [L: 2 T:1 P:0]

Subject Code : BEETC-505PE

Course Objectives :

1. To make computer system convenient to use in an efficient manner.
2. To provide users a continent interface to use the computer system .
3. Course description covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, device management and deadlocks
4. To keep track of who is using which resource, to provide efficient and fair sharing of resources among users and programs

Course Outcomes :

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

1. Explain basic concepts of operating system
2. Understand the process management policies and scheduling algorithms
3. Design various memory management techniques
4. Analyze process synchronization techniques.
5. Evaluate deadlock detection and prevention mechanism

Unit 1 : **Introduction:**
(09)

Evolution of OS, Types of OS, Basic hardware support necessary for modern operating systems, services provided by OS, system programs and system calls, OS structures : Layered, Monolithic, Microkernel, disk space management, and space allocation strategies, disk arm scheduling algorithms

Unit 2 : **Process Scheduling:** **(06)**

Process Concepts, Process control block, types of schedulers, context switch, threads, multithreading model, goals of scheduling, and different scheduling algorithms, examples from Windows 2000 and Linux

Unit 3 : **Memory Management:** **(06)**

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging, paging faults and instruction restart, page replacement algorithms, working sets, Locality, Thrashing, Garbage collection

Unit 4 : **Process cooperation and synchronization:** **(06)**

Concurrency Conditions, Critical section problem, software and hardware solutions, Semaphores, conditional critical regions and monitors, classical inter process communication problems

Unit 5 : **File system:** **(09)**

File concepts , Access methods, directory structures, Recovery, Log-structured file systems. **Deadlock and Protection** : Deadlock characteristics, Prevention, Avoidance, Detection and Recovery, Goals of protection, access matrix, implementation, security problem

Suggested Books:

Text Books :

1. Operating system Concepts (8th edition) by Silberschatz, Peter B Galvin, and Greg Gagne, Willey Indian Edition 2010.
2. Modern Operating system (third edition) by Andrew s Tanenbaum, Prentice Hall of India (2008)
3. Operating systems by D. M. Dhamdhere, Tata McGraw Hill, 2nd Edition
4. Operating systems, 3rd edition by A. Godbole, TMH publications

Reference Books :

1. Operating systems (5th Edition), Internal and Design principles by Williams stallings, Prenctice Hall India, 2000
2. Operating systems: Concepts and Design by Milan Milenkovik, McGraw Hill Higher Education
3. Operating System (3rd Edition) b Garry Nut, Pearson Education
4. Operating system, 3rd edition by P Balkrishna Prasad, SciTech Publication

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Sensors and Systems (Elective) [L: 2 T:1 P:0]

Subject Code : BEETC-505PE

Course Objectives :

1. To understand basic working principle of various types of sensors.
2. To understand the sensors used in automobile applications.
3. To understand the sensors used in industries
4. To understand the various sensors used in IoT smart city project.
5. To illustrate various actuators and motors used in robotics field.

Course Outcomes :

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

1. Explain fundamental physical and technical base of sensors and actuators.
2. Describe basic laws and phenomena that define behavior of sensors and actuators.
3. Analyze various approaches, procedures and results related to sensors and actuators.
4. Create analytical design and development solutions for sensors and actuators.
5. Interpret the acquired data and measured results.

Describe application and development of sensors and actuators

Unit 1 : **Basics of Sensors:** **(08)**

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization, Design procedure while choosing the sensors for various application. Types of sensors: Inductive, capacitive and resistive sensors.

Unit 2: **Sensors used in Automobile Industries:** **(08)**

Camshaft Position Sensor ,Throttle Position Sensor ,Vehicle Speed Sensor, Voltage sensor, Fuel Temperature Sensor, Manifold Absolute Pressure (MAF) Sensor, Coolant Sensor, Spark Knock Sensor, Oxygen Sensor, Engine Speed Sensor, Mass airflow sensor. Selection of appropriate model & types of sensors, their Interfacing with microcontroller, calibration, characterization.

Unit 3: **Sensors used in Automation Industries:** **(08)**

Rotary transformer, torque transducer, passive seed sensors, smart position sensor, non-contact hall effect rotary position sensors, current and voltage sensors, hot metal detector,

proximity and displacement sensor. Selection of appropriate model & types of sensors, their Interfacing with microcontroller, calibration, characterization.

Unit 4 : **Sensors used in IoT Smart City Applications:** **(08)**

Temperature Sensor, Pressure Sensor, Accelerometer and Gyroscope Sensor, IR Sensor, Optical Sensor, Gas Sensor, Smoke Sensor, rain sensor, motion sensor, RFID. Selection of appropriate model & types of sensors, their Interfacing with microcontroller, calibration, characterization.

Case Study: Designing sensors interface for :

1. Smart traffic light system.
2. Waste management system.

Unit 5: **Actuators and motors used in Robotics:** **(10)**

Pneumatic and Hydraulic Actuation Systems- Actuation systems, Pneumatic and hydraulic systems, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves, Rotary actuators, Mechanical Actuation Systems Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

Suggested Books:

Text Books

1.Sensors and Signal Conditioning Wiley-Blackwell, 2008 Jacob Fraden, Handbook of
modern sensors, Springer, Stefan Johann Rupitsch.
2.Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer, 2018
Senturia S. D.

3. D. Patranabis, "Sensors and Transducers", PHI Learning Private Limited.

Reference Books :

1. W. Bolton, "Mechatronics", Pearson Education Limited.
2. Sensors and Signal Conditioning Wiley-Blackwell, 2008 Jacob Fraden, Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
3. Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer, 2018 Senturia S. D.
4. D. Patranabis, "Sensors and Transducers", PHI Learning Private Limited.
5. W. Bolton, "Mechatronics", Pearson Education Limited.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Information Theory and Error Correcting Codes(Elective) [L: 2 T:1 P:0]

Subject Code : BEETC-505PE

Objectives:

1. To study Introduction to Information Theory, Entropy, Mutual Information
2. To study Super Information, Channel Models.
3. To study error correcting codes
4. To study Hamming Codes, LDPC Codes, Introduction to Cyclic Codes,.
5. To study designing aspects of Antenna.

Course Outcomes:

At the end of the course, students will be able to -

1. Interpret and summarize the role of information theory and linear algebra in source coding and channel coding
2. Make use of various error control encoding and decoding techniques
3. Implement various error control techniques
4. Analyze the performance of error control codes.

	Hours per Week
UNIT I: Introduction to Information Theory, Entropy, Mutual Information, Conditional and Joint Entropy, Measures for Continuous Random Variable, Relative Entropy, Variable Length Codes, Prefix Codes, Source Coding Theorem, Various source coding techniques: Shannon-Fano, Huffman, Arithmetic, Lempel Ziv, Run Length, Optimum Quantizer, Practical Application of Source Coding: JPEG Compression	10
UNIT II Introduction to Super Information, Channel Models and Channel Capacity, Noisy Channel Coding Theorem, Gaussian Channel and Information Capacity Theorem, Capacity of MIMO channels	08

Unit III Introduction to Error Control Coding, Introduction to Galois Field, Generator Matrix and Parity Check Matrix, Systematic Codes, Error Detection and Correction, Erasure and Errors, Standard Array and Syndrome Decoding, Probability of Error, Coding Gain and Hamming Bound	10
Unit IV Hamming Codes, LDPC Codes, Introduction to Cyclic Codes, Generator Polynomial, Syndrome Polynomial and Matrix Representation, Golay Code, Introduction to BCH Codes: Generator Polynomials, Multiple Error Correcting BCH Codes, Decoding of BCH Codes	10
Unit V Introduction to Reed Solomon (RS) Codes, Introduction to Convolutional Codes, Trellis Codes: Generator Polynomial Matrix and Encoding using Trellis, Vitrebi Decoding, Introduction to Turbo Codes	10

TEXT BOOKS

1. K. Sam Shanmugam ,"Digital and analog communication systems", John Wiley, 1996.
2. Simon Haykin ,"Digital communication" , John Wiley, 2003.
3. Shu Lin, Daniel J.Costello, Jr, "Error Control Coding- Fundamentals and Applications" – Prentice Hall, Inc.
4. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.
5. T.M. Cover and J. A. Thomas, Elements of information theory, John Wiley & Sons, 2012.
6. R. M. Roth, Introduction to Coding Theory, Cambridge University Press, 2006.
7. Information theory, coding and cryptography, Ranjan Bose, McGraw Hill, 3 rd Edition, 2016.

REFERENCES

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2ndEdition, 2009, TMH.
6. S. Lin and D. J. Costello, Error Control Coding, 2 nd Edition, Prentice Hall, 2004.
7. R. E. Blahut, Algebraic Codes for Data Transmission, Cambridge University Press, 2002.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech.5 th Semester

Subject : Electronic Design Techniques with HDL(Elective-I) [L: 2 T:1 P:0]

Subject Code : BEETC-505PE

Learning Objective:

1) To enable the students to translate a functional system description into appropriate digital blocks coded in VHDL.
2) Perform synthesis, place, and route of a digital design into a target FPGA.

Prerequisite: Digital Design, C language.

Learning Outcomes:

At the end of the course, the students would be able to:

1) Design digital systems through HDL language
2) Simulate, synthesise, and implement HDL code
3) Implement code on FPGA/CPLD

Course Contents

Unit I : Introduction to VLSI and HDL:

History of IC Design, IC Technology, Moore's Law, IC Design Constraints, Feature Size, VLSI Family, Programmable Logic Devices, Designing with Programmable Logic- Design Entry, Simulation, Synthesis, Implementation, Device Programming, EDA Tools, IP Cores, Gjeski's Y Chart.

Digital system design process, Hardware simulation, Levels of abstraction, VHDL requirements, Elements of VHDL Top-down design, VHDL basic language Elements, VHDL operators, Timing, Concurrency, Objects, and classes.

Unit II : Behavioural Modeling:

Signal assignments, Concurrent and sequential assignments., Entity Declaration, Architecture Body, Behavioral Modeling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

Unit III : Dataflow and Structural Modeling Techniques:

Data flow Modeling, Concurrent Assignment statements, Block statements, Structural Modeling, Component declaration and Instantiation, Generate statements. Generics and Configuration, Subprogram, Overloading, Packages and Libraries, Design Libraries, Attributes.

Unit IV : FINITE STATE MACHINE: Overview of FSM, FSM representation, Moore machine versus Mealy machine, VHDL representation of an FSM, State assignment, Some FSM design examples – sequence detector, FSM based binary counter. Analysis of asynchronous sequential circuit – flow table reduction-races-state assignment-transition table and problems in transition table.

Unit V : Design for Synthesis:

Language directed view of synthesis, Inference from CSA statements, Inference from within Process, Inference using Signals v/s variables, Latch v/s Flip Flop Inference, Wait statements, Synthesis Hints, Synthesis for dataflow and structural models.

BOOKS RECOMMENDED:

[1]J. Bhasker, VHDL Primer, 3/e, Addison Wesley, 1999.

[2]Sudhakar Yalamanchili, Introductory VHDL-From Simulation to Synthesis, Pearson Education, 3/e Indian Reprint.

[3]Douglas Perry, VHDL, 3/e Edition, McGraw Hill 2001.

[4]Peter.J.Ashenden, The Designer's Guide to VHDL-AMS,

[5]Charles.H.Roth, Digital system Design using VHDL, Thompson Publishers, 2/e Edition, 2007.

[6]Ben Cohen, VHDL-Coding style and Methodologies, Kluwer academic Publishers, 1995.

[7].Volnei. A.Pedroni, Circuit Design with VHDL, MIT Press Cambridge, 2004.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech. 6th Semester

Subject : Computer Communication Networks [L: 3 T:0 P:2]

Course Objectives:

The objective of this course is to provide students with understanding of

1. Build an understanding of the fundamental concepts of computer networking and its topologies.
2. Learn about the transmission media used for wired and wireless network and learn the concept of switching techniques.
3. Learn the concept of network services and various protocols of Data Link Layer and MAC sub-layer.
4. Introduce the concept Network Layer and IP Addressing techniques.
5. Introduce transport layer services and its protocol Headers.
6. Introduce the function of Application Layer and Presentation layer paradigm and protocols.

Course Outcome:

At the end of this course, the students shall be able to

1. Describe the basics of Computer Network, Data Communication, Network topologies, transmission media and switching techniques.
2. Analyze the services and features of various protocols of Data Link Layer and MAC sub-layer.
3. Apply the concept of IP Addressing techniques and its various protocols of Network Layer.
4. Describe the transport layer, Application Layer services and its protocol Headers and analyze the congestion control protocols.
5. Explain the function of Application Layer and Presentation layer paradigm and protocols.

UNIT I: Computer Networks Overview and Introduction to Physical Layer

Introduction to Networks, Network Topology, Types of communication:-simplex, half duplex, full duplex, Network classification:- LAN,MAN,WAN, Network Architecture, Protocols, Services and primitives, OSI Reference Model, TCP/IP Reference Model.

Transmission Media:-Guided Media, Unguided, Structure of Switch, types of switches, Switching Techniques:-Circuit-switching, Message switching, packet switching,

UNIT II: Data Link Layer

Design Issues, Framing methods, Flow Control and Error Control, Stop-and-wait flow control, Sliding-window flow control, Stop-and-wait ARQ, Go-back-N ARQ, Selective-repeat ARQ, HDLC, MAC sub layer: ALOHA,CSMA-CD.

UNIT III: Network Layer:

Network layer duties, Routers, IP addressing and its classification, IPv4 address, IPv6 address, Mask and Subnet, Routing algorithms like Shortest path routing, Djkstra's algorithm, Bellman Ford Algorithm, Distance Vector Routing, Dynamic Routing.

UNIT IV: Transport Layer

Transport layer services, Connection oriented & Connectionless, Three-way handshaking, UDP model, TCP:- TCP header format, comparison between UDP and TCP, Need of Congestion control, Principal of congestion, Quality of Service (QoS), Token bucket and leaky bucket algorithm.

UNIT V: Application Layer

Application Layer: DNS, Electronic Mail, File Transfer (FTP), WWW, HTTP, SNMP, SMTP. Introduction to Cryptography, Secret key algorithm, public key algorithm, Digital Signature, Basics of Attacks and security.

TEXT BOOKS:

1. Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.

2. Computer Networks, A.S.Tanenbaum, 4th Edition, Pearson education.

Reference Books:

1. Data and Computer Communications, tenth Edition by William Stallings, Pearson Educations.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech. 6th Semester

Subject : Computer Communication Networks lab

LIST OF EXPERIMENTS

Course Outcomes:

CO1	To analyze and select various cables and Connectors used for networking with computer network security.
CO2	To verify the implementation results on software like NS2 and simulate different networking models and implement different networking protocols.
CO3	To understand different data transmission techniques using TCP and UDP Protocol for evaluating the different IP addresses for various systems.

Experiment No.1

To study Network Hardware components – Cables, NIC, Repeaters, Hubs, Bridges, Switches and Routers.

Experiment No.2

To demonstrate the formation of Local Area Network

Experiment No.3

To demonstrate data transmission using Ping protocol, tracert and IP configuration.

Experiment No.4

To study Network Simulator “ns-2”.

Experiment No.5

To perform the simulation of 2 Nodes in ns-2.

Experiment No.6

To create a Simple Network Topology in ns-2.

Experiment No.7

To understand TCP protocol using ns-2

Experiment No.8

To understand UDP protocol using ns-2.

Experiment No. 9

To perform PC to PC communication using RS-232 port.

Experiment No. 10

To configure Router.

Experiment No.11

To understand IP address of the system and Network Address Translation.

Experiment No.12

To study the Domain Name Server (DNS)

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech. 6th Semester

Subject : Internet of Things L :2 T :0 P:0 Credit : 2

Objectives:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Arduino/Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

Outcomes:
Upon completion of this course, the students should be able to:

- Analyze different design levels of IoT
- Analyse IOT Architecture
- Understand network and communication aspects
- Design a portable IoT using Rasperry Pi and Aurdino
- Analyze applications of IoT in real time scenario

Unit I : Introduction to IoT (**04)**

IoT definition & Characteristics, Advantages and disadvantages, IoT functional blocks, sensing , actuation , Physical design of IoT, Logical design of IoT, Constraints affecting design in IoT .

Unit II :IOT Architecture:- (05)

Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints , IoT reference model.

Unit III: M2M to IOT (05)

Introduction, Basic Concepts, Difference between IoT and M2M, M2M Value Chains, IoT Value Chains, Machine to Machine Communication, M2M to IoT- Architecture, Design principles and capabilities.

Unit IV: Network and Communication Aspects (05)

Wireless medium access issues, MAC protocol, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination, service model, service management and security.

Unit V : Introduction to different IoT tools (05)

Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi & Its Programming.

Case Study on Health care and Agriculture

References

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015 .

2. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence: By Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2014.

3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.

4. Honbo Zhou, ―The Internet of Things in the Cloud: A Middleware Perspective‖, CRC Press, 2012.

5. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols‖, Wiley, 2012

6. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, by Francis daCosta, 1st Edition, Apress Publications, 2013

Internet of Things Lab [0 L:0T:2P credit:1]

Hands-on experiments related to the course contents

At least Ten practical's are suggested to be performed based on above syllabus

1. Study various types of Arduino and install Arduino IDE.
2. Study temperature/humidity sensor. and write a program to monitor temperature/humidity using Arduino.
3. Study and implement RFID using Arduino.
4. Implement MQTT protocol using Arduino.
5. To study and Configure Raspberry Pi.
6. Study and implement Zigbee protocol using Arduino/ Raspberry Pi.
7. To interface Bluetooth with Arduino/ Raspberry Pi and write a program to send the sensor data to smartphone using Bluetooth
8. To interface LED/Buzzer with Arduino/ Raspberry Pi and write a program to turn on LED for 1 seconds after every two seconds.
9. To interface OLED with Arduino/ Raspberry Pi and write a program to print temperature and humidity.
10. To interface motor using relay with Arduino/ Raspberry Pi and write a program to turn on the motor.
11. Interface Ultrasonic sensor and IR sensor with Raspberry Pi and write a program to detect an object.
12. To interface ultrasonic sensor with Raspberry Pi/ Arduino and write a program to calculate distance of object.
13. Study of implementation of Web server using Node MCU and ESP module.
14. To create a local server using Node MCU.
15. To fetch humidity and temperature using DHT 11 sensor and sent it to local server.
16. Write a program to continuously monitor sensor reading through internet.
17. To generate API and program Node MCU.
18. To create Web page and control Home Appliances through Wi-Fi.
19. To create Adafruit account and using Adafruit to read sensor values and send data to node MCU.

20. To create local host server.

Note : The practicals are not restricted to this list. Faculties can explore more advanced practicals based on syllabus of ‘Internet of Things’.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering

B.Tech. 6th Semester

Subject : Internet of Things L :0 T :0 P:2 Credit : 1

Internet of Things

Hands-on experiments related to the course contents

At least Ten practical's are suggested to be performed based on above syllabus

- Study various types of Arduino and install Arduino IDE.
- Study temperature/humidity sensor. and write a program to monitor temperature/humidity using Arduino.
- Study and implement RFID using Arduino.
- Implement MQTT protocol using Arduino.
- To study and Configure Raspberry Pi.
- Study and implement Zigbee protocol using Arduino/ Raspberry Pi.
- To interface Bluetooth with Arduino/ Raspberry Pi and write a program to send the sensor data to smartphone using Bluetooth
- To interface LED/Buzzer with Arduino/ Raspberry Pi and write a program to turn on LED for 1 seconds after every two seconds.
- To interface OLED with Arduino/ Raspberry Pi and write a program to print temperature and humidity.
- To interface motor using relay with Arduino/ Raspberry Pi and write a program to turn on the motor.
- Interface Ultrasonic sensor and IR sensor with Raspberry Pi and write a program to detect an object.
- To interface ultrasonic sensor with Raspberry Pi/ Arduino and write a program to calculate distance of object.
- Study of implementation of Web server using Node MCU and ESP module.

- To create a local server using Node MCU.
- To fetch humidity and temperature using DHT 11 sensor and sent it to local server.
- Write a program to continuously monitor sensor reading through internet.
- To generate API and program Node MCU.
- To create Web page and control Home Appliances through Wi-Fi.
- To create Adafruit account and using Adafruit to read sensor values and send data to node MCU.
- To create local host server.

Note : The practicals are not restricted to this list. Faculties can explore more advanced practicals based on syllabus of ‘Internet of Things’.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Wireless Sensor Networks L :2 T :0 P:2 Credit : 2

Objectives:

1. Introduce wireless sensor network architectures and communications protocols provide an understanding of mutual relationships and dependencies between different protocols and architectural decisions by offering an in-depth investigation of relevant protocol mechanisms.
2. Introduction to wireless sensor networks: Challenges for WSNs, enabling technologies.
3. Introduce design spaces for sensor networks
4. Study wireless sensor network solutions with practical implementation examples and case studies.
5. Introduce sensor network platforms, operating systems and programming tools for sensor networks.
6. Single node architecture: Hardware components, energy consumption of sensor nodes, operating systems and execution environments.

Outcome: By the end of this course, the students shall be able to
1. Demonstrate advanced knowledge and understanding of the engineering principle of sensor design, signal processing, established digital communications techniques, embedded hardware and software, sensor network architecture, sensor networking principles and protocols.
2. Demonstrate a computing science approach, in terms of software techniques, for wireless sensor networking with emphasis on tiny sensors, sensor specific programming languages, RFID technology, embedded architectures, software program design and associated hardware, data fusion.
3. Demonstrate knowledge of the associated business, legislative, safety and commercial issues; future technological advances and the way these will impact on the engineering product enterprise process.

Unit: I Introduction to Wireless Sensor Networks and its Applications (4)

Introduction and Overview of Wireless Sensor Networks, Commercial and Scientific Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology, Sensor Taxonomy, wireless network environment.

Unit: II Wireless Transmission Technology and Medium Access Control Protocols (5)

Radio technology primer, Available wireless technologies, Fundamentals of Medium Access Control Protocols for Wireless Sensor Networks, MAC protocols for WSN, IEEE 802.15 4LR WPAN, Sensors Network Protocols, Data dissemination and gathering.

Unit: III Transport Control Protocols for Wireless Sensor Networks (5)

Transport Control Protocols for Wireless Sensors Networks, Traditional transport control protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP,Routing Challenges and design issues in wireless sensor network, Routing strategies in WSN.

Unit: IV Middleware and Network Management for Wireless Sensor Networks (5)

Middleware for Sensor Networks,WSN middleware principles, Middleware architecture, existing middleware.

Network Management for Wireless Sensor Networks, Requirements, Design issues, Examples of management Architecture: MANNA, Performance and Traffic Management Issues, Fundamentals of network security-challenges and attacks.

Unit V – Operating Systems and Hardware for Wireless Sensor Networks (5)

Introduction, Operating System Design Issues, Examples of Operating Systems: TinyOS, MANTIS, Programming tool: nesC,

Hardware: Examples like "Mica Mote" family, EYES nodes, BTnodes, Scatterweb,

Introduction to Network Simulator 3 (ns-3)

Text Books:

1. "Wireless Sensor Networks: Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience Publication, 2007

2. "Protocols and Architecture for Wireless Sensor Networks", H.Karl and A.Wiling, John Wiley & Sons, India,2012.

3. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati , 'Wireless sensor networks',Edition: 2, Published by Springer, 2004 .

Reference Books:

1. Morgan Kaufmann F. Zhao and L. Guibas, ' Wireless Sensor Networks',San Francisco, 2004.

2. "Computer Networks", Andrew Tanenbaum, 4th Edition, Pearson Education,2007

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Wireless Sensor Networks Laboratory L :0 T :0 P:2 Credit : 1

SubJect: Wireless Sensor Network

List of Practical:

1 Introduction of Wireless sensor network applications and its simulation.

2 Network Simulator installation of wireless sensor network.

3 Write TCL script for transmission between mobile nodes.

4 Write TCL script for sensor nodes with different parameters.

5 Generate TCL script for udp and CBR traffic in WSN nodes.

6 Generate TCL script for TCP and CBR traffic in WSN nodes.

7 Implementation of routing protocol in NS2 for AODV protocol.

8 Implementation of routing protocol in NS2 for DSR protocol.

9 Implementation of routing protocol in NS2 for TORA protocol.

10 Study other wireless sensor network simulators.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Computer Architecture (Elective-II) [L: 2 T:1 P:0]

Subject Code :BEEETC-604PE

Course Objective:

1. Discuss the basic concepts and structure of computers.
2. Understand the concepts of register transfer logic and arithmetic operations.
3. Understand the concept of memory management and virtual memory.
4. To identify and compare different methods for computer I/O.
5. Learn about Parallel Organizations –Parallel Processing and Multi Core Computers.

Course Outcomes:

Upon completing the course, students will be able to:

1. Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
2. To develop logic for assembly language programming using arithmetic and logical operations.
3. Distinguish the organization of various parts of a system memory hierarchy
4. Describe fundamentals concepts of pipeline and vector processing.
5. Analyze the performance of commercially available computers.

UNIT I: BASIC STRUCTURE OF COMPUTERS AND ITS PROCESSING UNIT:

Functional units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.
Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format, and Bit slice concept.

UNIT II: ARITHMETIC OPERATIONS:

Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth's Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

UNIT III: THE MEMORY SYSTEM:

Various technologies used in memory design, higher order memory design, multi-module memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

UNIT IV: INPUT/OUTPUT ORGANIZATION:

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

UNIT V:

RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution units, performance considerations.
Basic concepts in parallel processing & classification of parallel architectures. Vector Processing, Array Processors.

BOOKS:·

V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organisation, McGraw Hill,5thed,2002.
Computer Architecture & Organization III Ed- J.P.Hayes.
A.S.Tanenbaum, "Structured Computer Organization" 4th Edition, Pearson Education

REFERENCES BOOKS:

M Mano, "Computer System and Architecture", Pearson Education
W. Stallings, "Computer Organization & Architecture", Pearson Education

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Data Base Management System(Elective-II) L :2 T :1 P:0 Credit : 3

Course Code		**Department**	ETC /ECE
Type	Elective - II	**Semester**	6 Sem
Credits	3	**Pre-requisites, if any**	
Exam Duration	T: 3 Hrs, P: 0	**Max marks**	70 + 30 (Internal)
Course Objectives	Get introduced to Data Base Management System 1. To understand general idea of data base management system 2. To develop skills to design databases using data modeling and design techniques 3. To develop skills to implement real life applications which involves data handling 4. Demonstrate an understanding of careers opportunities in subject areas of designing, storage techniques, data handling and managing techniques		
Course Outcome	**At the end of this course students will able to** 1.Understands basic database concepts and data modeling techniques used in data base design . 2. Study the concept of functional dependency and perform the calculus with design database by using different normalization techniques 3. Study query processing and perform optimization on query processing 4. Understand the concept of transaction processing and different recovery techniques used in RDBMS 5. Study and Implement advanced database which are used in real time system		

Course Details:

Unit No.	Particulars*	TH
1	**Introduction to Database Systema:** Approaches to building a database, Three Schema architecture of database, Challenges in building a DBMS, DBMS architecture, Various components of DBMS, Types of Data models.	7
2	**Relational Data Model:** Concepts of Relation, Schema-instance Distinction, keys, referential integrity	8

	and foreign keys, Relational algebra operators, Tuple Relational calculus, Domain relational calculus, **Physical and Logical hierarchy** : Concept of index, B trees, hash index, function index, bitmap index, concepts of functional dependency , normalization (1NF, 2NF, 3NF, BCNF etc)	
3	**Query Processing and Optimization :** Query processing and optimization process, measures of query cost estimation in query optimization, pipelining and materialization, structures of query evaluation plans	7
4	**Transactions:** Transaction concepts, properties of transactions, Serializability of transactions, testing of serializability, system recovery, Two phase commit protocol, Recovery and Atomicity, Log based recovery, concurrent execution of transactions, Locking mechanisms, solotion to concurrency related problems, deadlock, Isolation	7
5	**Recovery system and advanced database:** Failure classification, recovery and atomicity, log based recovery, check points, buffer management, advanced recovery techniques, Web databases, Distributed databases, Data warehousing, Data Mining, Data security, NOSQL databases.	7
	Total	36

Text Books:

1. Database system concepts by Avi Silberschtz, Henry F Korth, S Sudarshan, Tata McGraw Hill
2. Fundamental of Database systems – Elmasiri and Navathe Addison Wesley 2000 Systems – C J Date, A Kannam, S Swamynathan, 8th edition
3. An introduction to Database

Reference Books

1. Database Management system by Raghu Ramkrishnan and Johannes Gehrke, Tata McGraw Hill publications, 3rd edition
2. Introduction to database management system by Kahate, Pearson publication

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Control System Engineering (Elective-II) L :2 T :1 P:0 Credit : 3

Course Code		**Department**	ETC /ECE
Type	Elective - II	**Semester**	6th Sem
Credits	3	**Pre-requisites, if any**	Linear Differential Equation; Laplace Transform; Network Theory
Exam Duration	T: 3 Hrs, P: 0	**Max marks**	70 + 30 (Internal)
Course Objectives	Get introduced to Control System Engineering 5. Learn to derive mathematical models of typical engineering processes 6. Learn the construction of Root locus. 7. learn about the use of Transfer function 8. learn about the Stability of Control system 9. Learn about the State space Analysis.		
Course Outcome	**At the end of this course students will able to** 1.Understand the basic linear feedback principles and find out the transfer function using various methods. 2. Sketch the root locus and determine the location of the closed loop poles. 3. Analysis of Time response 4. Understand the different types of controller 5. Analysis of State space model		

Course Details:

Unit No.	Particulars*	TH
1	**Introduction to Control System:** Introduction, Classification of Control system, Representation of Electrical, Mechanical, Electro mechanical, Thermal, Pneumatic, Hydraulic system with differential equation, Concept of Transfer Function and State space representation. Advantages of State Space representation over Classical representation.	6

2	**Transfer Function, Block Diagram & Signal flow graph:** Representation of Transfer Function of Electrical & Mechanical , Block diagram algebra, Signal flow graph	8
3	**Time Response Analysis :** Time response of system, first order and second order system, standard inputs, concept of gain and time constants. Steady state errors, type of control system, approximate methods for higher order system. Types of Controllers.	6
4	**Stability & Root Locus:** Stability of control systems, condition of stability, characteristics equation, Routh Hurwitz criterion, special cases for determining stability, relative stability. Root location and effect on time response, elementary idea of root locus, Construction of root locus effect of addition of pole and zero in proximity of imaginary axis	8
5	**State Space Analysis:** State variable method of analysis, characteristics of system state. Choice of state variables, representation of vector matrix differential equation, standard form, relation between transfer function and state variables.	8
	Total	44

Suggested Books:

1.I.J.Nagrath, M.Gopal, " Control System Engineering",6th Edition, New age International Publishers

2.B.C.Kuo , "Automatic Control System", PHI

3. B.S. manke, "Linear Control Systems", Khanna Publishers

Reference Books

3. A.K.Jairath, " Problems and Solutions of Control systems", CBS Publishers, New Delhi
4. Nagrath&Gopal, "Control System Analysis".

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject : Antenna and Wave Propagation (Elective-II) L :2 T :1 P:0 Credit : 3

Prerequisites: Basic knowledge of Electromagnetic Fields

Course Objectives:

1. To study transmission line characteristics.
2. To study the basics of radiating elements and effect of propagation of radio waves in actual environment.
3. To study the antennas, their principle of operation, analysis and their applications.
4. To study the features of Antenna array, Microstrip antenna and reflector antenna.
5. To study designing aspects of Antenna.

Course Outcomes:

At the end of the course the students shall be able to:

1. Describe transmission line characteristics.
2. Calculate antenna parameters (radiation pattern, beam width, lobes, directivity, gain, impedance, efficiency, polarization)
3. Analyze wire antennas (monopoles, dipoles, and loops).
4. Analyze and design antenna arrays.
5. Describe the operation of broadband and traveling wave antennas.
6. Describe the operation of aperture and reflector antennas.
7. Analyze and design Microstrip antennas.

SYLLABUS

UNITS	**Hours per Week**
UNIT I: **Transmission Lines** Transmission line equations and their solution, transmission line parameters, characteristics impedance, propagation constant, attenuation constant and	10

phase constant, waveform distortion, distortionless transmission lines, loading of transmission lines, reflection coefficient and VSWR, Equivalent circuits of transmission lines, transmission lines at radio frequency, open and short circuited lines, smith chart, stub matching.	
UNIT II **Antenna Basics & Thin Linear Wire Antennas** **Antenna Basics** Introduction, basic antenna parameters – patterns, beam area, radiation intensity, beam efficiency, directivity, gain, resolution, antenna apertures, effective height, front to back ration, antenna basic concepts. **Linear wire & loop antennas:** Infinitesimal dipole, its radiation field, radiation resistance, radiation sphere, near field, far field, small dipole, finite length dipole, half wave length dipole, linear elements near or on infinite perfect conductors, ground effects and their application, folded dipole, Small loop, comparisons of small loop with magnetic dipole, radiation pattern its parameters and their application.	12
Unit III **Antenna Arrays** Linear arrays, planer arrays and circular arrays. Array of two isotropic point sources, non – isotropic sources, principle of pattern multiplication, linear arrays of n elements, broadside, End fire, radiation Pattern, directivity, Beam width and null directions, array factor, Antenna analysis using Dolph-Tschebyscheff, the Log-periodic antenna	08
Unit IV **Microstrip antennas & Reflector antennas** **Microstrip antennas:** Radiation Mechanism of Microstrip antenna, feeding methods, methods of analysis, Multiband Microstrip antenna for Mobile Communication, Circularly Polarized Patch antenna, Rectangular & circular patch, Circular polarization and feed network. **Reflector antennas:** Simple reflectors, the design of a shaped Cylindrical reflector, Radiation patterns of Reflector Antennas, Dual shaped Reflector Systems Plane reflector, Corner reflector, horn antenna, aperture antenna.	10
Unit V **Antenna Measurements** Reciprocity in antenna Measurements, Near-Field & Far-Field, Co-ordinate System, Sources of Error in antenna measurements, measurement ranges, measurement of different antenna Parameters, antenna ranges, radiation pattern, Gain and directivity, Polarization, Radio Wave Propagation: Atmosphere of Earth, Terrestrial Propagation of Electromagnetic waves, Fading, Noise and interference, Ground wave propagation, Ionospheric propagation	08

BOOKS

Text Books:

1. Antenna Theory analysis and design – Costantine A. Balanis, John Wiley publication
2. Antenna and Wave propagation, - K.D. Prasad, Satya Prakashan
3. Electromagnetic – Jordan Balmann, Prentice Hall of India publication
4. Antenna Theory and Design , Robert S. Elliott , Wiley Student Edition
5. Electromagnetic Waves- R. K. Shevgaonkar

Reference Books:

1. Antenna & Wave Propagation , Sisir K Das, Mc Graw Hill
2. Harish A. R., Antenna and wave Propagation, Oxford University Press
3. Antennas and Radio Propagation, R.E. Collins, Mc Graw –Hill

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Course Code :BEETC605OE **Sem. : 6th semester** **Course: Consumer Electronics (Open Elective-I)**

Total Credits : 3 **Th.: 2 Tu.: 1 Pr.: 0** **hours per week:- 3**

Prerequisites: Basic knowledge of Electrical and Electronics Engineering

Course Objectives:

6. To give students an in depth knowledge of various electronic consumer Electronics gadgets,
7. To study various audio and video devices and systems.
8. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices.

Course Outcomes:

At the end of the course the students shall be able to:

8. Describe various audio gadgets used in domestic and commercial applications
9. Describe various video gadgets used in domestic and commercial applications
10. Explain satellite communication technology along with DTH for day to day application
11. Describe various types of home appliances used in domestic life like washing machine, oven RO plant, Mixer, grinder, vaccume cleaner etc
12. Understand various types of home appliances used in domestic life like printers, food processors, Induction devices, scanner and fax machines etc.

SYLLABUS

UNITS	**Hours per Week**
Unit I:- Audio Systems (8 Periods)	8

Audio amplifier, microphone, loudspeaker, Public address systems, What is DJ,Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.block diagram of home theatre & working	
Unit II:-Video Systems (15 Periods) Elements of TV communication system,Scanning and its need, Difference between a conventional CTV with LCD & LED TVs. Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV. IPS panels and their features. Different types of interfaces like HDMI, USB, RGB etc. TV Remote Control–Types, parts and functions, IR Code transmitter and IR Code receiver. Working principle, operation of remote control. Different adjustments, general faults in remote control Projectors:- Differentiate LCD and LED projectors. Specifications of LED Projector Working principle of LED Projector. Most frequently occurring faults in a LED projector and Cameras:- Types of cameras and their specifications used in CCTV systems. CCTV setup and its components Working of Digital Video Recorders and types of DVRs	15
Unit III:-Satellite Communication and Technology(10 Hours) Basic satellite communication, Merits& Demerits of satellite communication, applications, types of satellite & its orbits, Satellite Frequency Bands. Basic components of DTH system: PDA, LNBC, Satellite receiver terminal, dish installation aspects, Azimuth & elevation settings of dish/ DTH receiver. Types of cables used in DZTH system, impedance and specification Multi-dwelling unit design, headed amplifier, line amplifier, cascaded in/out multi-switch, tap, and splitter. Set top box features, block diagram of set top box, I/O ports, Cable modem termination system, software & customer premises equipments	15
Unit IV4.Introduction to different type of domestic/commercial appliances Part I:- Washing M/c: different types of machines, washing techniques, (Block diagram) parts of manual, semiautomatic and fully automatic machines, basic working principle of manual, semi- automatic and fully automatic machines, study the working of motors, different types of timers, power supply circuits. Vacuum cleaner (Block diagram) working principle, main parts of Vacuum cleaner, study of different features of the machine, study & working of motor used, Electronic circuit, power supply. Various parts & functions of Mixer/Grinder, speed control circuit & auto overload protector. Principle of electric iron, parts of steam iron, thermostat heat controls. Working principal of RO and UV type of water purifiers, Different components of water purifier, consumables required, Most frequently occurring faults and their remedial procedures referring to the manual. Principal of Immersion heater, part of immersion heater, Insulation in Immersion heater. Working principle of Induction cook top, study of	13

different features of machine. Types of induction tubes, study of different component of induction cooktop, Fault identification, Heat sinking in induction cooktop.	
Unit V5.Introduction to different type of domestic/commercial appliances Part II:- Operation of Micro-wave oven: Different types of oven, study the various functions of Oven, Block diagram of microwave oven, Electrical wiring diagram of microwave oven, Microwave generation system-circuit, Food Processors and their parts and functions:-Printers:-Printer & its types, principle, parts, working of dot matrix , inkjet & Laser printer, Advantages, disadvantages of each, comparison between impact &non-impact printers & cables used to connect the various printers to computer. Digital Electronic Lock,Xerox Machine,Scanner, fax machine	13

BOOKS

Text Books:

1) Consumer Electronics 1 Edition (English, Paperback, Bali S. P.)
2) Consumer Electronics (English, Paperback, Gupta B R)
3) **"Consumer Electronics – A Conceptual Approach" by Dr J S CHITODE**
4) **"A Beginners Guide to Consumer Electronics Repair: Hand Book and Tutorial" by Douglas Kinney**
5) **"Consumer Electronics" by Anand**
6) **"Troubleshooting Consumer Electronics Audio Circuits" by H Davidson**

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Course Code :BEETC605OE	**Sem. : 6th semester**	**Course: Industrial Electronics (Open Elective-I)**
Total Credits : 3	**Th.: 2 Tu.: 1 Pr.: 0**	**hours per week:- 3**

Unit 1:- Electronic and Electromechanical Sensors(15 hours)

Mechanical and Electrical Switch Classifications • Mutually and mechanically Activated Electronic Circuit Switches, Discrete Output Devices, Relays, Control Diagrams. Discrete Automation Sensors and Devices , Introduction to Electronic Sensors, Non-contact Sensors, Sensor Output Interfaces, Analog Automation Sensors, Sensor Applications and Selection, Integrating Sensors into Power and Control Circuits, Position, displacement, velocity, acceleration, force, flow, level temperature, humidity, Thermocouples, RTD, LVDT, Servo-pots, strain gauges, P, PI, PID converters, average to rms converters

Unit 2:-Smart Sensors(10 hours)

Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays. Smart Transducers: Ultrasonic Transducers; Sonic Transducers; Air Transducers

Unit 3:- Actuators(13 hours)

Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators; Vibration Dampers; Shakers; Fluidic Pumps; Motors, Solenoid valves, Hydraulic systems, Pneumatic Systems, DC and AC stepper motors, Dosing equipment weigh feeders, dosing pumps, extrusion – bulk and film electronic components. Medical equipments.

Unit 4:- Analog Process Control Devices and safety (12 hours)

Process Actuators and Output Devices, Control Valves, Electrical Heating Elements, Control Sensors, Transmitters, and Transducers, Temperature Sensors, Pressure Sensors, Flow Sensors, Level Sensors, Position Sensors, Presence Sensors, Interlock Devices,

Unit 5:- Programmable Logic Controllers(PLCs) SCADA(Supervisory Control and Data Acquisition System)(15 hours)

Rotory encoders, digipots.0-10V and 4-20mA systems, used in PCLs for analog input and output signals, Automation: Transfer machines, robotics basics, Application of PLCs,Industrial heating: Arc furnace, high frequency heating, High frequency source for induction heating, dielectric heating and microwave heating, Ultrasonic- Generation and applications, Case studies of industrial applications.

Books

- S. K. Bhattacharya and S. Chatterjee, "Industrial Electronics &Control", Tata McGraw Hill, 2003.
- Terry. L. M. Bartell, "Industrial Electronics", Delmer Publishers, 1997.
- Thomas. E. Kissell, " Industrial Electronics", 2002.
- INDUSTRIAL ELECTRONICS AND CONTROL Paperback – 1 July 2017by S Bhattacharya (Author), S. Chatterjee (Author)

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject: Effective technical Communication (Theory)

Course Code :BEETC606T CREDITS: 02

Teaching Scheme Examination Scheme

Lectures: 2 Hours/Week Duration of Paper: 02 Hours

Tutorial: 1 hour/week University
Assessment: 35 Marks
College Assessment: 15 Marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations(IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Course Outcomes: After completing the course, the students will be able to

1. acquire knowledge of structure of language.
2. Build vocabulary and face interview process and can become employable.
3. develop business writing skills.
4. Understand technical and scientific writing skills.

Course Structure

Unit1.FunctionalGrammar: (6 hours**)**

Common errors, Transformation of Sentences (Change the voice, Change the narration,

transformation of Simple , Compound, Complex sentences), Use of Phrases, Idioms& Proverbs.

UnitII. English for Competitive Exams & Interview Techniques:

(6hours)

Prefix, Suffix, Word building processes, **English** words /phrases derived from other languages, Technical Jargons, Synonyms/Antonyms, Verbal Analogies, Give one word for, Types &Techniques of Interview

Unit III.Formal Correspondence and Analytical Comprehension

(6hours)

Job applications and Resume Writing, Business Letters,(Enquiry, Quotation, Orders, Complaints), Writing Memorandum, Circulars, notices, e-mail etiquettes, Unseen Comprehension passages

UnitIV. Technical &Scientific Writing:

(6hours)

Features of Technical Writing, Technical Report writing, Writing Manuals, Writing Project and research Proposals, Writing Research papers.

- **Reference Books:**
- EffectivetechnicalCommunicationbyBarunK.Mitra,OxfordUniversityPress,
- *TechnicalCommunication-PrinciplesandPractice*byMeenakshiRaman&Sharma,OxfordUniversityPress,2011, ISBN-13-978-0-19-806529-
- *HowtoPrepareaResearchProposal*:GuidelinesforFundingandDissertationsintheSocialandBehavioralSciencesbyKrathwohl&RDavid
- *TechnicalWriting-ProcessandProduct*bySharonJ.Gerson&StevenM.Gerson,3rdedition,PearsonEducation Asia, 2000
- *Developing Communication* skills by Krishna Mohan & Meera Banerjee
- *Functional English by* Dr. P. Mahato and Dr. Dora Thompson, Himalaya Publications

B. Tech. Eighth Semester (CBCS)
(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VI

CMOS VLSI Design

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC801 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

Objectives:

Outcome: By the end of the course, the students shall be able to

1. Describe and interpret the basic concepts of MOS transistors,

2.Construct the ability to design a system, component or process as per needs and specifications.

3. Analyze inverter design, characteristics and applications and performance parameters of CMOS Circuits.

4. Evaluate circuits using different CMOS styles and measure performance of the complex logic structures.

Unit:1 Introduction of MOSFETs (10 Hours)

Introduction of MOSFETs: CMOS Fabrication Process steps, NMOS Enhancement Transistor, MOS Transistor Operations, PMOS Enhancement Transistor, Regions of Operations, Threshold Voltage, MOS Device Equations, Small Signal Modeling of MOSFETs.

Unit:2 Logic Design With MOSFETs (10 Hours)

Logic Design With MOSFETs: Ideal Switches and Boolean Operations, MOSFETs as Switches, Basic Logic Gates in CMOS, Compound Gates in CMOS, Transmission Gate Circuits (TG), Pass Transistor.

Unit:3 MOS inverter Characteristics (9 Hours)

MOS inverter Characteristics: Resistive load inverter, Inverters with n type MOSFET load, CMOS inverter, Principle of operation, DC characteristics, Tristate Inverter, Noise Margin, Introduction to Bi-CMOS Inverter.

Unit:4 Combinational circuit design (9 Hours)

Combinational circuit design, static CMOS, Ratioed Logic circuits, Analysis of CMOS Logic Gates: MOS Device Capacitance, Switching Characteristics, Rise Time, Fall Time, Propagation Delay, Power Dissipation in CMOS, Charge Sharing, Fan-in, Fan-out, Complex Logic Structures, Complementary Static CMOS, Pseudo NMOS Logic, Dynamic CMOS Logic, CMOS Domino Logic, CMOS Pass Transistor Logic.

Unit:5 Sequential Circuit Design & Data path VLSI System Components: (10 Hours)

Sequential Circuit Design, Latches and Flip Flops. Advanced Techniques in CMOS Logic Circuits: and FlipFlops, data path design, Data path VLSI System Components: Comparators, barrel shifters, Multiplexers, Binary Decoders, Equality Detectors and Comparators, Priority Encoders, Shift and Rotation Operations, Bit Adder Circuits, Multipliers.

Text Books:

1 John P. Uyemura, Introduction to VLSI Circuits and Systems, Students Edition, Wiley Publication.

REFERENCE BOOKS:

1 Neil H. E. WesteHarris, Principle of CMOS VLSI Design, 4th Edition, Addison Wesley VLSI Series.

2 Sung-Mo Kang, Yusuf leblebici, CMOS VLSI Design, Third edition, 2008, TataMcGraw Hill.

B. Tech. Eighth Semester (CBCS)

(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VI

Artificial Intelligence

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC801 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

Objectives:

Outcome: By the end of the course, the students shall be able to

1. Develop an understanding what is involved in AIML.
2. Understand learning algorithms of AIML.
3. Understand the deep learning.
4. Apply the knowledge for the selection of tool and languages for problem solving
5. Understand the use of AIML for real world problems.

Unit I: Introduction to Artificial Intelligence (9 Hrs.)

What Is Artificial Intelligence? History, AI and Society, Agents and Knowledge based systems, Components of AI

Unit II: Propositional Logic (9 Hrs.)

Propositional Logic, First order logic, limitations of logic, Search, Games and Problem Solving, Reasoning with Uncertainty

Unit III: Machine Learning (10 Hrs.)

Supervised learning, Unsupervised learning, Reinforcement learning: Model based learning, Regression, Decision trees, Linear Discrimination, Kernel Machines and Graphical Models

Unit IV: Artificial Neural Networks and Deep Learning (10 Hrs.)

Biological neural network, Artificial neural network, Hopfield network, Neural Associative memory, Linear networks, Backpropogation algorithm, Support Vector Machines, Basics of deep learning.

Unit V: Introduction to Platforms, Tools, Frameworks and languages for AIML (10 Hrs.)

Top AIML Softwares: Salesforce Einstein, IBM Watson, Deep Vision, Cloud Machine Learning Engine, Azure Machine Learning Studio, Nvidia Deep Learning AI, Playment; Machine learning tools: TensorFlow, Amazon Machine Learning, Accord.NET, Apache Mahout, Shogun; Programming languages: Python, R, Java, Julia, C/C++, Others: Scikit Learn, Theano, Caffe, MxNet, Keras, PyTorch, CNTK, Auto ML, OpenNN, H20: Open Source AI Platform, Google ML Kit

Text Books:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence" 2 nd Edition, UTiCS, Springer

2. Ethem Alpaydın ,"Introduction to Machine Learning" 3rd Edition,The MIT Press, Cambridge, Massachusetts London, England.

REFERENCE BOOKS:

1. John Paul Mueller, Luca Massaron John Wiley & Sons ,"Artificial Intelligence for Dummies" First, 2018

2. Steven W. Knox,Wiley" Machine Learning A Concise Introduction" First, 2018

B. Tech. Eighth Semester (CBCS)

(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VI

MEMS

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC801 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

Objectives:

Outcome: By the end of the course, the students shall be able to

1. Apply the principles behind the operation of MEMS devices
2. Choose a micromachining technique for a specific MEMS fabrication process
3. Understand recent advancements in the field of MEMS and devices

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Unit - I : (9 Hrs)

Introduction to MEMS: Benefits of Miniaturization, Types of MEMS: Optical MEMS, Bio- MEMS, RF- MEMS, Microfludics, Success Stories, Pressure sensor, Accelerometer, Micro-mirror TV Projector.

Unit - II : (9 Hrs)

Microfabrication and Micromachining : Integrated Circuit Processes, Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding, High Aspect-Ratio Processes (LIGA), MEMS Device fabrication using Bulk Micromachining.

Unit - III : (10 Hrs)

Surface Micromachining : One or two sacrificial layer processes, Surface micromachining requirements, Device fabrication using Surface Micromachining example, Microcantilever fabrication.

Unit - IV : (10 Hrs)

RF MEMS Devices : Capacitor, Inductor, Switches, and antennas, RF MEMS components in communications, space and defense applications.

Unit - V : (10 Hrs)

Physical Micro sensors : Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Sensor

Principles and Examples : Thermal sensors, Electrical Sensors, Mechanical Sensors, Chemical and Biosensors.

Text Books:

1. Micro and Smart Systems: Ananthasuresh, G. K., Vinoy, K. J., Gopalakrishnan, S., Bhat, K. N., and Aatre, V. K., Wiley-India, New Delhi, (1/E) (2010).
2. RF MEMS and Their Applications: Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, (1/E) (2002).

REFERENCE BOOKS:

1. Microsensors, MEMS and Smart Devices , Julian W. Gardner , Vijay K. Varadan, Osama O. Awadelkarim, Wiley, (1/E) (2001).
2. VLSI Technology, Sze S.M., Mc Graw Hill, (2/E).

B. Tech. Eighth Semester (CBCS)

(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VII

VLSI Signal Processing

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC802 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

Objectives:

1. To learn pipelining & parallel processing techniques.
2. To understand folding & unfolding techniques in multirate system
3. To address folding techniques used to design time multiplexed architecture.

Outcome: By the end of the course, the students shall be able to

1. Learn various methodologies to optimize power delay and area of VLSI design.
2. Build Real Time processing system.
3. Design of algorithm structure for DSP algorithms based on algorithm transformation

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Unit I: Pipeling and Parallel Processing (09)

Introduction, pipeling of FIR Digital filters Parallel processing, Pipelining and parallel processing for low power.

Unit II: Retiming (09)

Introduction, Definition and properties, solving system of inequalities, retiming techniques.

Unit III: Unfolding (10)

Introduction, algorithms for unfolding, Properties of unfolding, Critical path, unfolding and retiming Application of unfolding.

Unit IV: Folding (10)

Introduction Folding Transformation, Register minimization in folded architectures, Folding in Multirate systems.

Unit V: Fast Convolution (10)

Introduction, Cook- Toom algorithm, Winogard algorithm, Iterated convolution, Cyclic Convolution, Design of Fast Convolution Algorithm by Inspection.

Text Books:

1. Keshab K. Parhi. "VLSI Digital Signal Processing Systems" Wiley-Inter Sciences. 1999

2. Mohammed Ismail, Terri, Fiez, "Analog VLSI signal and information processing", McGraw Hill ,1994.

3. Keshab. Parthi, "VLSI Digital signal processing system Design and implementation" Wiley- Inter science, 1999.

4. kung. S.Y., H.J. While house T.Kailath "VLSI and Modern singal processing", prentice hall, 1985.

5. Jose E. France, Yannis Tsividls "Design of Analog Digital VLSI circuits for telecommunications and signal processing" prentice Hall, 19994.

B. Tech. Eighth Semester (CBCS)

(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VII

Android Mobile Application Development

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC802 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

COURSE OBJECTIVES:

1. To facilitate students to understand android SDK

2. To help students to gain a basic understanding of Android application development

3. To inculcate working knowledge of Android Studio development tool

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

1. Identify various concepts of mobile programming that make it unique from programming for other platforms,

2. Critique mobile applications on their design pros and cons,

3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features, and

5. Deploy applications to the Android marketplace for distribution.

UNIT - I Introduction to Android: (09)

The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT - II Android Application Design Essentials: (09)

Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT - III Android User Interface Design Essentials: (10)

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT - IV Testing Android applications (10)

Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT - V Using Common Android APIs:

Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1.T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

REFERENCE BOOKS:

1. R1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd

2. R2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd

3. R3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

B. Tech. Eighth Semester (CBCS)

(Electronics & Communication/ Electronics & Telecommunication /Electronics Engineering)

PEC-VII

Satellite Communication

Duration: 3 Hr.
College Assessment: 30 Marks
University Assessment: 70 Marks

Subject Code: BEETC802 PE **[4 –0- 0 – 0]** **Credit: 4-0-0-4**

Objectives:

1. To learn working principle of satellite communication system.
2. To understand the orbital aspects and components of a satellite communication system.
3. To analyze the link budget of a satellite communication system and study of satellite orbits and launching.
4. To get knowledge and relate different components in satellite communication and use them in projects.

Outcome: At the end of the course, the student shall be able to:

1. Do research with capabilities in the design, development and manufacture of satellite communication systems used in a wide spectrum of applications.
2. Experience real world experience from household appliances to sophisticated satellite communication, from electronic ignition to neural networks and signal processing chips & to integrate academic discipline with project-based engineering applications, classroom learning theory
3. Able for Acquisition of technical competence in specialized areas of Satellite Communication engineering.
4. Able to identify, formulate and model problems and find Satellite Communication engineering solutions based on a system approach.

UNIT I: (09)

Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem.

UNIT II: (09)

Satellite link design: System noise temperature and T / T ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified (C / N).

UNIT III: (10)

Multiple access techniques: FDMA, FDM / FM / FDMA, effects of intermodulation, companded FDM / FM / FDMA, TDMA, TDMA frame structure and design, TDMA synchronization and timing, code division multiple access, SS transmission and reception; Applicability of CDMA to commercial system, multiple access on board processing SCPS system, digital speech interpolation system, DAMA.

UNIT IV: (10)

Propagation on satellite: Earth's path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature.

UNIT V: (10)

Error detection and correction, channel capacity, error detecting codes, linear block codes, error correction with linear block codes, performance of block error correction codes, convolution codes, cyclic codes, BCH and codes, error detection on satellite links. Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station.

Text BOOKS:

1. "Satellite Communication" by T. Pratt. Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2003.
2." Satellite Communication", D. C. Agrawal, Khanna Publishers
3. "Satellite Communication", Dennis Roddy , 4th Edition, McGraw- Hill International edition, 2006.
4. "Satellite Communication", T. T. Hai., Mc.Graw Hill Publications

REFERENCES BOOKS:

1. Satellite Communication Systems Engineering, W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.
2. Satellite Communication, Mark R Chartrand, Cenage Learning

B. Tech. Eighth Semester (CBCS)

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engineering)

Project phase 2

Subject Code: BEETC-803P **[L:0 –P:12- T:0 – 12]** **Credit: 0-6-0-6**

Course Objectives:

The object of Project Work II is to enable the student to extend further the extend project taken up under Project Phase-I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry

Course Outcome: By the end of the course, the students shall be able to

1. Analyze or Design the Electronics /telecommunication /allied Engineering problems by using appreciate methodology in a team work.
2. Interpret the communication skills of team members and
3. Use of Modern tools in the field of Electronics Engineering

Guidelines:

- In continuation to semester VII project work, the group of the students shall collect all necessary information pertaining to the project and analyse it.
- The group of the students shall prepare and submit a detailed report on the project.
- Student group shall try to implement project in minimum cost and learn financial aspect of project.
- Preferably project definition shall be in discussion and association with any industry
- The report shall be type written on A4 size papers and hard bound as per prescribed norms.
- Broadly the report shall include: Introduction, Literature Review, Problem definition, Data collection and analysis, Results (Numerical / Experimental), Conclusions and discussions.
- Acquaintance with survey and research methods and their use in conducting systematic investigations, use of data analysis tools, computational methods and style of report, preparation and presentation shall form basis of evaluation.
- The group shall prepare and present a seminar based on this work before an external examiner

N.G. Bawane