B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING
(2nd Year)

Total Contact Hours = 30 **Total Marks = 900** **Total Credits = 25**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMAT0-F91	Mathematics -III	3	1	0	40	60	100	4
BECE1-301/ BECE2-301	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE1-302/ BECE2-302	Network Analysis & Synthesis	3	1	0	40	60	100	4
BECE1-303/ BECE2-303	Digital Electronics	3	1	0	40	60	100	4
BECE1-304/ BECE2-304	Signal & Systems	3	1	0	40	60	100	4
BECE1-305/ BECE2-305	Electronic Devices and Circuits - I Lab	0	0	2	60	40	100	1
BECE1-306/ BECE2-306	Digital Electronics Lab.	0	0	2	60	40	100	1
BSOS0-F91	Soft Skills -I	0	0	2	60	40	100	1
BECE1-307/ BECE2-307	Training -I	0	0	4	60	40	100	2
Total	**Total 5 Theory & 3 Lab. Courses**	**15**	**5**	**10**	**440**	**460**	**900**	**25**

Total Contact Hours = 27 **Total Marks = 900** **Total Credits = 23**

SEMESTER 4th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-408/ BECE2-408	Electronic Devices & Circuits -II	3	1	0	40	60	100	4
BECE1-409/ BECE2-409	Analog Communication Systems	3	1	0	40	60	100	4
BECE1-410/ BECE2-410	Object Oriented Programming	3	1	0	40	60	100	4
BECE1-411/ BECE2-411	Electromagnetic Field Theory	3	1	0	40	60	100	4
Departmental Elective-I		3	0	0	40	60	100	3
BECE1-456/ BECE2-456	Antenna &Wave Propagation							
BECE1-457/ BECE2-457	Data Structures and Algorithms							
BECE1-458/ BECE2-458	Electronic Instrumentation							
BECE1-459/ BECE2-459	Reliability Engineering							
BECE1-412/ BECE2-412	Electronic Devices & Circuits -II Lab.	0	0	2	60	40	100	1
BECE1-413 BECE2-413	Analog Communication Systems Lab.	0	0	2	60	40	100	1
BECE1-414/ BECE2-414	Object Oriented Programming Lab.	0	0	2	60	40	100	1
BSOS0-F92	Soft Skills -II	0	0	2	60	40	100	1
Total	**Total 5 Theory & 2 Lab. Courses**	**15**	**4**	**8**	**440**	**460**	**900**	**23**

In House / Industrial Training of 6 Weeks during Summer vacations

ENGINEERING MATHEMATICS-III

Subject Code: BMAT0-F91 **L T P C** **Contact Hrs.- 45**
3 1 0 4

UNIT-I (13 Hrs)

Fourier Series: Periodic function, Fourier Seies, Dirichlet's conditions, Fourier series for even and odd functions, Change of interval, Half range Fourier series, Other forms of Fourier series.
Fourier Transforms: Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse Theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Properties of Fourier transform, Convolution theorem of Fourier transforms, Parseval's identity.

UNIT-II (10 Hrs)

Laplace Transforms: Laplace transforms of various standard functions (Exponential, Algebraic, Sine, Cosine), Properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function,
Application of Laplace Transforms: Solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

UNIT-III (12 Hrs)

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients. Classification of partial differential equation.
Applications of PDEs: Wave equation and Heat conduction equation in one dimension.
Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

UNIT-IV (10 Hrs)

Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues(Integration Of type $\int_0^{2\pi} F(Cos\theta, Sin\theta)d\theta$, $\int_{-\infty}^{\infty} \frac{f(x)}{F(X)}dx$)

Recommended Books:

1. E. Kreyszing, 'Advanced Engineering Mathematics', 8th Edn., John Wiley, New Delhi.
2. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, New Delhi.
3. Ian N. Sneedon, 'Elements of Partial Differential Equations', McGraw- Hill, Singapore, **1957**.
4. Peter. V. O'Nil, 'Advanced Engineering Mathematics', Wadsworth Publishing Company.
5. H.C. Taneja, 'Engineering Mathematics', Volume-I & II, I.K. Publisher.

ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code: BECE1-301/ BECE2-301 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
This course is meant to provide fundamental knowledge to ECE students for understanding of the basic semi-conductor devices and their behaviour under various conditions.

Learning Outcomes:
Student after undergoing this course student will be able to:
1. Understand the concepts of PN junction diode and their applications
2. Understand BJT characteristics and determine their behavior under low and high frequencies.
3. Understanding of FETs and their characteristics
4. To understand low and high frequency models

UNIT-I (12 Hrs)

Semiconductor Diodes: Semi-conductor materials and their characteristics, PN junction Diode - VI characteristics, qualitative and quantitative analysis of its behaviour, Diode resistance, Transition capacitance and Diffusion capacitance, clippers, clampers, rectifiers. Special purpose diodes - Zener diode, varactor diode, schottky diode.

UNIT-II (12 Hrs)

Bipolar Junction Transistor: BJT – Transistor current components, BJT configurations – CE, CB, CC and their characteristics. Transistor Biasing –Operating point determination, fixed bias, emitter bias, voltage-divider bias. Bias stability – Stabilization against variation in Ico, V_{BE} and β, Bias compensation.

UNIT-III (12 Hrs)

Field-Effect Transistor: The junction FET - construction, operation, characteristics, parameters, Biasing of JFET, Small signal analysis of JFET as an amplifier- common source and common drain amplifiers. Metal Oxide Semiconductor FET: MOSFET- construction, operation, characteristics, parameters, CMOS devices, CMOS inverter characteristics, metal semiconductor.

UNIT-IV (12 Hrs)

Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters

Recommended Books

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw- Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', 6th Edn., Pearson Education, **2002.**
4. Sedra, S. Adel and Smith, Kenneth C., 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

NETWORK ANALYSIS & SYNTHESIS

Subject Code: BECE1-301/BECE2-301 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives

- To aware the students about the basics of networks.
- To provide them basic concepts of different types of network theorems & their applications.
- To impart knowledge about different circuit analyzing and synthesizing methods of circuits

Learning Outcomes

- An ability to design, analyze and synthesize the circuits.
- Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.
- Understand fundamental concepts of network synthesis.
- To understand design and analysis of filters.

UNIT-I (12 Hrs)

Laws and Basic Theorems: Fundamental Laws and Concepts – Kirchhoff's current and voltage laws, Node and mesh analysis using classical method and Laplace transform, Concept of independent and dependent sources, Analysis of special signal waveforms, Duality in networks. Network Theorems – Superposition, Reciprocity, Thevenin's, Norton's, Millman's, Maximum power transfer, Tellegan's, Circuit analysis using these theorems.

UNIT-II (12 Hrs)

Transient Analysis: Fundamental signals and their mathematical expressions, Transient response analysis of RL, RC and RLC for various signals using differential equations and Laplace transform

UNIT-III (12 Hrs)

Two Port Networks: Fundamental concepts of network synthesis, Hurwitz Polynomials, Positive real functions, Properties of RC, RL & LC networks, Foster and Cauer forms of realization, Transmission zeroes, Synthesis of transfer functions.

UNIT-IV (12 Hrs)

Passive Filter: Design and analysis of Butterworth and Chebyshev approximations, Normalized specifications, Frequency transformations, Frequency and impedance denormalisation, Types of frequency selective filters, Linear phase filters.

Recommended Books

1. Vanvalkenburg, 'Network Analysis', Prentice Hall of India Pvt. Ltd., New Delhi.
2. D. Roy Choudhary, 'Network and Systems', New Age International Publisher.
3. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley Publications.

DIGITAL ELECTRONICS

Subject Code: BECE1- 303/BECE2- 303 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives

- To provide knowledge about basics of Digital Electronics.
- To impart knowledge about designing of digital circuits.
- Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Learning Outcomes

- An ability to understand all types of combinational & sequential digital circuits and their designing.
- Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.
- To understand various sequential circuits & various Digital Logic families
- Understand Analog to Digital and Digital to Analog converters and finite state machines

UNIT I (12 Hrs)

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

UNIT II (12 Hrs)

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

UNIT III (12 Hrs)

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

UNIT IV (12 Hrs)

A/D and D/A converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs.

Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

Recommended Books

1. R.P. Jain, 'Modern Digital Electronics', Tata McGraw Hill.
2. Malvino & Leach, 'Digital Principles and Applications', McGraw Hill.
3. Taub & Schilling, 'Digital Integrated Electronics', McGraw Hill.

SIGNAL & SYSTEMS

Subject Code: BECE1-304/BECE2-304 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Learning Objectives

- To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
- To be able to think critically & to apply problem solving & reasoning strategies to the analysis of

various types of signals & systems.
- To impart them knowledge of various types of noises.

Learning Outcomes
- An ability to analyze various types of signals in communication system.
- Developing skills to understand random signals
- To understand various types of noises
- Understand signal transmission through linear networks.

UNIT-I (12 Hrs)

Systems and Signal Analysis: Detailed Classification of Signals and Systems, Fourier Series and its properties, Fourier transform and its properties along with applications, Discrete Time Fourier Series (DTFS) and Discrete Time Fourier Transform (DTFT).

Correlation and Spectral Density: Definition of Correlation and Spectral Density, Analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

UNIT-II (12 Hrs)

Random Signal Theory: Introduction to Probability Theory, Definition of Probability of Random Events. Joint and Conditional Probability, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Examples of PDF, Transformation of Random Variables. Random Processes, Stationary and Ergodicity.

UNIT-III (12 Hrs)

Introduction To Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure. Experimental determination of Noise Figure, Pulse Response and Digital Noise and its elimination.

UNIT-IV (12 Hrs)

Signal Transmission Through Linear Networks: Convolution Theorem and its graphical interpretation. The Sampling Theorem, Low Pass and Band Pass Networks, Matched Filter, Enveloped detector.

Recommended Books

1. B.P. Lathi, 'Digital and Analog Communication System', 4th Edn,, Oxford University Press, **2000.**
2. Ravi Kumar, 'Signals and Systems', PHI Learning, **2009.**
3. Simon Haykin, 'Signals and Systems', 2nd Edn., Wiley Publications, **2008.**
4. D. Ganesh Rao and Satish Tunga, 'Signals and Systems', Pearson Publications, **2000.**

ELECTRONIC DEVICES AND CIRCUITS LAB - I

Subject Code: BECE1-305/BECE2-305 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Learning Objectives
- To understand the Characteristics of various semiconductor devices and construction of different electronic circuits using the above devices.
- To introduce variety of sources to obtain specifications of electronic devices & to impart knowledge about write technical reports related to basic electronic circuits using correct technical vocabulary.

- Able to understand identification and selection of various electronic components.

Learning Outcomes

- An ability to understand all types of electronics devices and circuits
- An ability to design and conduct experiments, as well as to analyze and interpret data

CONTENTS

1. Study of Zener regulator as voltage regulator
2. Study of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To study the characteristics of a Class- A amplifier.
5. To study the characteristics of Class- B amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To plot a load line for a CE amplifier and show effect of input signal on Q-point.
9. To demonstrate use of a BJT in a CE amplifier circuit configuration and study its frequency response.
10. To demonstrate use of a BJT in a CC amplifier circuit configuration and study its frequency response.
11. To demonstrate use of a power BJT as an amplifier.

Note: At least 08 experiments are required to be performed.

DIGITAL ELECTRONICS LAB

Subject Code: BECE1-306/BECE2-306 **L T P C** **0 0 2 1** **Duration: 24 Hrs.**

Learning Objectives

- To provide knowledge about basics of Digital Electronics.
- To impart knowledge about designing of digital circuits.
- Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Learning Outcomes

- An ability to understand all types of combinational & sequential digital circuits and their designing.
- Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.

CONTENTS

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates;
2. Realization of OR, AND, NOT and XOR functions using universal gates.
3. Realization Half Adder / Full Adder using Logic gates.
4. Realization Half Subtractor / Full Subtractor using Logic gates
5. Design 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter.
6. Design 4-Bit magnitude comparator using logic gates. Multiplexer: Truth-table verification and realization of Half adder and Full adder using MUX.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using DEMUX.
8. Flip Flops: Truth-table verification of RS, JK, D, JK Master Slave Flip Flops.

9. Design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
10. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.

Note: At least 08 experiments are required to be performed.

ELECTRONIC DEVICES AND CIRCUITS - II

Subject Code: BECE1-408/BECE2-408 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Learning Objectives

- To aware the students about Basic Electronic Components.
- To update the Knowledge about amplification circuits to amplify the signal.
- Various types of circuits to generate signals.
- How electronic components are specified and selected for industrial applications.

Course outcomes:

- After the completion of the course, the students could have learnt about the basic Electronic Circuits, their operational characteristics and their applications.
- To generate an ability to understand various amplifiers including push pull and complementary symmetry.
- Understand types of feedback amplifiers and oscillator circuits.
- To understand a stable multivibrators

UNIT-I (12 Hrs)

Single Stage Amplifiers: Classification of Amplifiers - Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Multistage Amplifiers: Frequency response – Single stage amplifiers, multistage amplifiers. Couplings – Various coupling methods for multistage amplifiers.

UNIT-II (12 Hrs)

Transformer coupled audio amplifier: construction, working, efficiency & distortion analysis; Classifications: Class-A, Class-B, class-AB and Class-C amplifiers, efficiency.

Push-Pull Amplifiers – operation of Class-B push-pull amplifier, crossover distortion, transistor phase inverter, complementary symmetry amplifier.

UNIT-III (12 Hrs)

Feedback amplifiers – Feedback concept, advantages and disadvantages of negative and positive feedback.

Oscillators: Classification of Oscillators, frequency and frequency stability of oscillatory circuits, Tuned Oscillators, Hartley Oscillator, Colpitts Oscillators Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator.

UNIT-IV (12 Hrs)

Astable Multivibrators: Astable Collector coupled and emitter coupled multivibrator, complementary Transistor Astable multivibrator.

Switching Characteristics of Devices: Diode and transistor as electronic switch, Breakdown mechanism in diode, Effect of temperature on diode, Charge storage phenomena, switching times in diode and transistor, Delay time, Rise time, Storage time and fall time.

Recommended Books

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', 3rd Edn., Tata McGraw- Hill, New Delhi, **2010.**
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education, **2004.**
3. Thomas L. Floyd, 'Electronic Devices', 6th Edn., Pearson Education, **2002.**
4. Adel S. Sedra and Kenneth C. Smith, 'Microelectronic Circuits', 4th Edn., Oxford University Press, New York, **1997**.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices'. 5th Edn., Prentice Hall of India, **2004.**

ANALOG COMMUNICATION SYSTEMS

Subject Code: BECE1-409/BECE2-409 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Learning Objectives

- To study & understand the building blocks of analog communication system in general and understand bandwidth consideration
- Inter-symbol Interference allows the students to understand the interference causes and the corrective measures taken by base band Pulse shaping solutions
- To study coherent and non-coherent detection techniques and Simulation of these techniques using Mat lab.

Learning Outcomes

- An ability to understand analog communication system and modulation techniques
- An ability to learn design of useful circuits required in analog communication system.
- An ability to explore knowledge about various transmitter and receiver circuits used in communication.
- An ability to provide students with tools for communication signal analysis

UNIT-I (12 Hrs)

Wave Propagation: Free space equation, Reflection from earth's surface, Surface and Space wave propagation, Range of space wave propagation, Effective earth's radius, Duct propagation, Troposphere propagation. Structure of ionosphere, propagation of radio waves through ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field

UNIT II (12 Hrs)

Analog Modulation Techniques: Introduction, Theory of Amplitude Modulation; AM Power Calculations, AM Modulation with a Complex wave, Theory of Frequency Modulation (FM); Spectra of FM Signals, Narrow Band and Wide Band FM, Theory of Phase Modulation, Comparison of AM and FM, Comparison of PM and FM, Noise and Frequency Modulation, Pre-emphasis and De-emphasis.

UNIT-III (12 Hrs)

AM Transmission/AM Reception: Introduction, Generation of Amplitude Modulation, Basic Principles of AM Generation; Square law Diode Modulation, Vander Bijl Modulation, Suppressed Carrier AM

Generation, Ring Modulator, Balanced Modulator. Tuned Radio Frequency (TRF) Receiver, Basic Elements of AM Super-heterodyne receiver; RF Amplifiers Characteristics-Sensitivity, Selectivity, Image Frequency Rejection, Mixers Tracking and Alignment, Local Oscillator, IF Amplifier, AM Detectors; Envelope or

Diode Detector, AGC, AM Receiver using Transistors Communication Receiver, Applications of AM with different Band ranges

UNIT-IV (12 Hrs)

FM Transmission/FM Reception: Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission.FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, Travis Detector Foster Seely or Phase Discriminator, Indirect methods of FM Demodulation; FM Detector using PLL and Stereo FM Multiplex Reception. SSB Transmission/SSB Reception: Advantages of SSB transmission, Generation of SSB; Independent Side-Band Systems (ISB), Vestigial Side-Band Modulation (VSB). SSB Product Demodulator, Balanced Modulator as SSB Demodulator, ISB/Suppressed Carrier receiver, Applications of FM with Band ranges.

Recommended Books

1. George Kennedy, 'Electronic Communication System', McGraw- Hill, **2000.**
2. Gary M. Miller and Jeffery S. Beasley, 'Modern Electronic Communications' PHI, **2009.**
3. Simon Haykin, 'Communication Systems' 3rd Edn., Wiley Publishers, **2007.**
4. Wayne Tomasi, 'Electronics Communication Systems', 5th Edn., Pearson Publishers, **2008.**

OBJECT ORIENTED PROGRAMMING

Subject Code: BECE1-410/BECE2-410 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Learning Objectives

- To provide knowledge regarding the Object oriented programming C++, data types and about classes.
- To provide understanding of inheritance and memory management in C++.
- To describe how to represent pointers, and understanding the concept of binding and polymorphism.
- To make the students familiar with the File handling and generic functions.

Learning outcomes

- An ability to learn programming in C++ using OOPs in a better way.
- Enable students to develop their skills in programing with C++.

UNIT-I (12 Hrs)

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and members functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of *const* keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

UNIT-II (12 Hrs)

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators, pointer to an object, *this* pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

UNIT-III (12 Hrs)

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

UNIT-IV (12 Hrs)

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.

Files: Fill streams, hierarchy of file stream classes, reading/writing of files, error handling during file operations, accessing records, randomly, updating files.

Recommended Books

1. E. Balagurusamy, 'Object Oriented Programming with C++', Tata McGraw Hill.
2. R.S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House.
3. R. Lafore, 'Object Oriented Programming in C++', Waite Group.

ELECTROMAGNETIC FIELD THEORY

Subject Code: BECE1-411/BECE2-411 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Learning Objectives

- To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
- Study of physical concept and all the important fundamental parameters of transmission lines and waveguides.

Learning Outcome

- After the completion of the course, the students will be familiar with the concepts of electromagnetic field theory and fundamental equations fields.
- An ability to Understand Maxwell's equations in differential and integral form,
- To understand transmission lines and smith chart

UNIT-I (12 Hrs)

Introduction: Fundamental of vector algebra, Scalar & vector fields, Introduction and transformation on different coordinate systems: (rectangular, cylindrical and spherical co-ordinate system). Introduction to line, surface and volume integrals, definition of gradient, divergent and curl of a vector and their physical significance.

UNIT-II (12 Hrs)

Electrostatics: Principal of Coulomb's law, definition of electric field intensity from point charges, field due to continuous distribution of charges on an infinite and finite line, Electric Field due to an infinite uniformly charged sheet. Gauss's law and its applications, Electric flux density, potential fields duo to electric dipole, Laplace and poisons equations.

Magnetostatics: Definition and explanation on Magnetic Field intensity due to a finite and infinite wire carrying current. Magnetic field intensity on rectangular loop carrying current, Ampere's Circuital law and its applications, Biot-savart law, the Lorentz force equation for a moving charge, Magnetic Vector Potential

UNIT-III (12 Hrs)

Time Varying EM Fields: Maxwell's equation in differential and integral vector form and their interpretations, continuity of currents, conduction and displacement current, boundary conditions, Helmholtz equations, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal incidence and surface impedance. Energy Flow and Poynting theorem, interpretation of E×H, Simple application, complex pointing vector.

UNIT-IV (12 Hrs)

Transmission Lines: Transmission line model, parameters and properties of transmission line equations, reflections in transmission lines; voltage, current and impedance relations-open, short circuit and matched lines, Standing wave ratio; impedance matching, quarter and half wave lines, single stub and double stub matching; circle diagram – Smith chart.

Recommended Books

1. Matthew N.O. Sadiku, 'Elements of Engineering Electromagnetics', Oxford University Press.
2. William Hayt, 'Engineering Electromagnetics', Tata McGraw-Hill.
3. Narayana Rao, 'Elements of Engineering Electromagnetics', Pearson Education.
4. R.F. Jorden, 'Electromagnetic Waves & Radio System', Prentice Hall India.
5. J.D. Kraus, 'Electromagnetics', McGraw-Hill.

ELECTRONIC DEVICES AND CIRCUITS LAB - II

Subject Code: BECE1-412/BECE2-412 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Learning Objectives

- To understand the Characteristics of various semiconductor devices and construction of different electronic circuits using the above devices.
- To introduce variety of sources to obtain specifications of electronic devices & to impart knowledge about write technical reports related to basic electronic circuits using correct technical vocabulary.
- Able to understand identification and selection of various amplifiers and oscillators.

Learning Outcomes

- An ability to understand all types of electronics devices and circuits
- An ability to design and conduct experiments, as well as to analyze and interpret data

Course Content

1. To study frequency response of a tuned amplifier.
2. To demonstrate and study a two stage RC coupled amplifier.
3. To demonstrate and study a Transformer coupled amplifier.
4. To study the response of RC phase shift oscillator and determine frequency of oscillation.
5. To study the response of Hartley oscillator and determine frequency of oscillation.
6. To study the response of Colpitt's oscillator and determine frequency of oscillation.
7. To study the response of Wien Bridge oscillator and determine frequency of oscillation
8. To demonstrate working of a JFET and study its V-I characteristics.
9. To experimentally study working of a CS JFET amplifier.
10. To demonstrate working of a LED and calculate appropriate value of series Resistance RS for it.

Note: At least 08 experiments are required to be performed.

ANALOG COMMUNICATION SYSTEMS LAB

Subject Code: BECE1-413/BECE2-413 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Learning Objectives

- The main objective of this lab is to motivate the students to familiarize with modulation & Demodulation Techniques and study their waveforms on Digital storage oscilloscope.
- To give students a working knowledge to perform wired and wireless communication in lab.
- The objective of the Analog Communications Course is to familiarize students with the functions of oscillators, filters, amplifiers, LC networks, modulators, limiters, mixers, and detectors in AM, FM, PM, SSB, and PLL circuit

Learning Outcomes

- An ability to perform transmission of signals from transmitter to receiver using various analog modulation and demodulation techniques.
- Study of transmission through different types of antenna.

Course Content

1. To study Amplitude Modulation using a transistor and determine depth of modulation.
2. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.

3. Frequency Modulation using Voltage Controlled Oscillator.
4. Generation of DSB-SC signal using Balanced Modulator.
5. Generation of Single Side Band (SSB) signal.
6. Study of Phase Lock Loop (PLL) and detection of FM Signal using PLL.
7. Measurement of Noise Figure using a noise generator.
8. Study functioning of Super heterodyne AM Receiver.
9. Familiarization of PLL, measurement of lock/captures range, frequency demodulation, and frequency multiplier using PLL.
10. Measurement of Sensitivity, Selectivity and Fidelity of radio receivers.

Note: At least 08 experiments are required to be performed.

OBJECT ORIENTED PROGRAMMING LAB

Subject Code: BECE1-414/BECE2-414 **L T P C** **Duration: 24 Hrs**
0 0 2 1

Learning Objectives

- To provide the basic knowledge about control statements, looping statements, various I/O statements and various data structures.
- To describe how to create classes in C++ for understanding of basic OOPS features.
- To discuss various concepts of data hiding, function overloading and operator overloading

Learning Outcome

- Enable students to develop their skills in programing with C++.
- To describe functions of creating constructors, destructor, inheritance, polymorphism and file handling programs

Course Content

1. [Classes and Objects] Write a program that uses a class where the member functions are defined inside a class.
2. [Classes and Objects] Write a program that uses a class where the member functions are defined outside a class.
3. [Classes and Objects] Write a program to demonstrate the use of static data members.
4. [Classes and Objects] Write a program to demonstrate the use of const data members.
5. [Constructors and Destructors] Write a program to demonstrate the use of zero argument and
6. parameterized constructors.
7. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
8. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
9. [Initializer Lists] Write a program to demonstrate the use of initializer list.
10. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
12. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
13. [Typecasting] Write a program to demonstrate the typecasting of basic type to class type.
14. [Typecasting] Write a program to demonstrate the typecasting of class type to basic type.

15. [Typecasting] Write a program to demonstrate the typecasting of class type to class type.
16. [Inheritance] Write a program to demonstrate the multilevel inheritance.
17. [Inheritance] Write a program to demonstrate the multiple inheritances.
18. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
19. [Polymorphism] Write a program to demonstrate the runtime polymorphism.
20. [Exception Handling] Write a program to demonstrate the exception handling.
21. [Templates and Generic Programming] Write a program to demonstrate the use of function template.
22. [Templates and Generic Programming] Write a program to demonstrate the use of class template
23. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
24. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.

Note: At least 15 experiments are required to be performed

ANTENNA & WAVE PROPAGATION

Subject Code: BECE1-456/BECE2-456 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Learning Objectives

- To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
- Study of physical concept of radiation patterns and all the important Fundamental Parameters of antennas with antenna Arrays in the antenna terminology

Learning Outcome

- An ability and development of skill of students to design highly effective communication system.
- After completion of the course, students will be aware with the various performance parameters of the antenna system design and antenna arrays.
- Understand various types of antennas such as micro strip and Yagi-uda antennas.
- To understand Ground wave propagation.

UNIT-I (12 Hrs)

ANTENNA BASICS: Directional properties of antennas, Radiation patterns, antenna gain and aperture, antenna terminal impedance, self and mutual impedance, front to back ratio, antenna beam width and bandwidth, antenna efficiency, antenna beam area, polarization, antenna temperature and Reciprocity properties of antennas.

UNIT-II (12 Hrs)

ANTENNA ARRAYS: Classification of arrays, linear arrays of two point sources, linear arrays of n-point sources, pattern multiplication, array factor, linear arrays of equal amplitude and spacing (Broadside and end fire arrays) of n-point sources, directivity and beam width, non-uniform arrays excitation using Binomial series.

UNIT-III (12 Hrs)

SPECIAL ANTENNAS: VLF and LF antennas (Hertz and Marconi antennas), effects of antenna height and effect of ground on performance of antenna, Rhombic antennas, Loop antennas, receiving antenna

and radio direction finders. Folded dipole antennas, Yagi-uda antenna, horn antennas, microwave dish, helical antennas, frequency independent antennas, micro strip antennas, fractal antennas.

UNIT-IV (12 Hrs)

GROUND WAVE PROPAGATION: Characteristics for ground wave propagation, reflection at the surface of a finitely conducting plane and on earth, Attenuation Calculation of field strength at a distance.

IONOSPHERE PROPAGATION: The ionosphere, formation of the various layers, their effective characteristics, reflection and refraction of waves by ionosphere, virtual height, maximum frequency, skip distance, regular and irregular variation of ionosphere, Fading and Diversity reception, ordinary and extraordinary waves.

SPACE WAVE PROPAGATION: Space wave, range and effect of earth, Troposphere waves-reflection, refraction, duct propagation, Troposphere scatter propagation link

Recommended Book

1. J.D. Kraus, 'Antennas', McGraw Hill.
2. C.A. Balanis 'Antennas Theory and Design', Willey.
3. K.D. Prasad, 'Antenna & Wave Propagation', Satya Parkashan, New Delhi.

DATA STRUCTURES AND ALGORITHMS

Subject Code: BECE1-457/BECE2-457 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Learning Objectives

- To use object oriented programming to implement data structures.
- To introduce linear, non-linear data structures and their applications.

Learning Outcomes

Upon completion of the course, students will be able to:

- Explain the concepts of algorithms, trees and graphs.
- Write simple applications of data structures.
- Discuss the different methods of organizing large amount of data**.**

UNIT-I (12 Hrs)

INTRODUCTION: Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

DEVELOPMENT OF ALGORITHMS: Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.

UNIT-II (12 Hrs)

LINKED LISTS: Singly linked lists, linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction.

TREES: Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees (AVL), B-trees, B+ -trees.

UNIT-III (12 Hrs)

GRAPHS: Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and bi-connected components, graph matching.

UNIT-IV (12 Hrs)

SORTING AND SEARCHING TECHNIQUES: Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Recommended Books

1. J.P. Tremblay and P.G. Sorenson, 'An Introduction to Data Structures with Applications', Tata McGraw Hill.
2. S. Sahni, 'Data Structures, Algorithms ad Applications in C++', WCB/McGraw Hill.
3. Aho, Ullman and Hopcroft, 'Data Structures and Algorithms'.
4. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, 'Data Structures using C', Pearson Education.

ELECTRONIC INSTRUMENTATION

Subject Code: BECE1-458/BECE2-458 **L T P C** **3 0 0 3** **Duration: 48 Hrs.**

Learning Objectives

- To provide knowledge about different types of measuring, waveform generation, and analysis electronics instruments.
- Exposure to various methods of data transmission and transduction.
- Elaborate discussion about recorder & display devices.

Learning Outcomes

- Able to understand operation of different instruments and able to describe different terminology related to measurements.
- A recognition and understanding of various analog measuring instruments.
- Measurement of Resistance and understanding of CRO

UNIT – I (12 Hrs)

Units, Dimensions and Standards: SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

General Theory of Analog Instruments: Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/ weight ratio, pointers and scales

UNIT –II (12 Hrs)

Analog Measuring Instruments: Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/applications.

UNIT – III (12 Hrs)

Measurement of Resistances: Low, Medium & High Resistance their measurement.

Bridges: Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

UNIT-IV (12 Hrs)

Cathodes Ray Oscilloscopes: Principles and working of CRO, CRO– probes, Measurement of voltage, frequency and phase angle with CRO.

Recommended Books

1. A.K. Sawhney, 'Electrical & electronic Measurement and Instrumentation', Dhanpat Rai & Sons.
2. J.B. Gupta, 'A Course in Electrical and Electronics Measurement & Instrumentation', S.K. Kataria & Sons.

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RELIABILITY ENGINEERING

Subject Code: BECE1-459/BECE2-459 **L T P C** **3 0 0 3** **Duration: 48 Hrs.**

Learning Objectives

1. To provide students with a comprehensive understanding on various aspects of reliability engineering
2. To enable students to understand reliability considerations in designing machine components, elements and systems
3. To ensure sound maintenance of machines and systems and bring about reliability improvement
4. To perform reliability engineering analysis and its management throughout the product life cycle.

Course Outcomes

After successful completion of this course the students will be able to:

1. Demonstrate understanding of basic reliability measures such as failure rate, availability, MTTR, etc.
2. Compute and evaluate reliability for redundant, series, and parallel systems
3. Develop fault trees and apply various reliability models to identify and analysis possible faults in machine systems and assess their impact on overall system reliability & maintainability.
4. Use reliability improvement techniques and undertake product testing.

UNIT-I (12 Hrs)

Introduction: Definition for Reliability, Static and Dynamic Reliability Need for reliability Engineering, success and failure models, Causes of failures, catastrophic failures and degradation failures Characteristic types of failures, useful life of components, Exponential case of chance failure, Reliability Measures; MTBF, MTTR, hazard rate, probability distribution function, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Raleigh, Weibull, Gamma distribution, marks, Chains, failures data analysis.

UNIT-II (12 Hrs)

Series Parallel Systems: Reliability Block Diagrams, series systems, parallel systems, K-out of-M systems, open and short circuits failures, standby systems.

Reliability Analysis of Non-Series Parallel System: Boolean algebra Method, Outset approach, delta star method, logical signal relation method, Bay's Theorem Method.
Reliability Prediction: objective of reliability prediction, classification, and information sources for failure rate data, prediction methodologies, general requirements, Role and limitations of Reliability prediction.

UNIT-III (12 Hrs)

Reliability Allocation: subsystems reliability improvement, allocation for new units, criticality.
Maintainability and Availability: forms of maintenance, measures of Maintainability and availability, maintainability function, availability function, two-unit parallel system with repair, Markov Model for two unit systems, preventive maintenance, provisioning of spares.

UNIT-IV (12 Hrs)

Reliability Testing: kinds of testing, component reliability measurements, parametric methods, confidence limits, accelerated testing, equipment acceptance testing, standard life testing plans, accelerated life testing, system safety analysis-FMECA, risk priority number and its allocation.
Economics of Reliability Engineering: Reliability cost, Life Cycle Costing, effect of reliability on cost, reliability achievement cost models, reliability Utility cost models, Replacement policies.

Recommended Books

1. K.K. Agarwal, 'Reliability Engineering', Kluwer Academic Press, USA, **1993.**
2. E. Balagurusamy, 'Reliability Engineering', Tata McGraw Hill, 4th Reprint, **2003.**
3. L.S. Srinath, 'Reliability Engineering', East West Press Pvt. Ltd, 3rd Edn., **1991.**
4. Brijendra Singh, 'Quality Control and Reliability Analysis', Khanna Publishers, **1998.**
5. E.E. Lewis, 'Introduction to Reliability Engineering', John Wiley and Sons, **1987.**