B. TECH. ELECTRONICS & INSTRUMENTATION ENGINEERING

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/ BECE3-301	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE1-303/ BECE2-303/ BECE3-302	Digital Electronics	3	1	0	40	60	100	4
BECE3-303	Electrical Measurements & Instruments	3	1	0	40	60	100	4
BECE1-302/ BECE2-302/ BECE3-304	Network Analysis & Synthesis	3	1	0	40	60	100	4
BECE1-305/ BECE2-305/ BECE3-305	Electronic Devices and Circuits - I Lab.	0	0	2	60	40	100	1
BECE1-306/ BECE2-306/ BECE3-306	Digital Electronics Lab.	0	0	2	60	40	100	1
BSOS0-F91	Soft Skills -I	0	0	2	60	40	100	1
BECE3-307	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**	
BECE3-408	Linear Control System	3	1	0	40	60	100	4
BECE3-409	Transducers & Sensors	3	1	0	40	60	100	4
BECE3-410	Electrical and Electronics Instrumentation	3	1	0	40	60	100	4
BECE3-411	Microprocessors & Peripheral Devices	3	1	0	40	60	100	4
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BECE1-456/ BECE2-456/ BECE3-456	Antenna &Wave Propagation							
BECE1-457/ BECE2-457/ BECE3-457	Data Structures and Algorithms							
BECE1-458/ BECE2-458/ BECE3-458	Electronic Instrumentation							
BECE1-459/ BECE2-459/ BECE3-459	Reliability Engineering							
BECE3-412	L Control System Lab.	0	0	2	60	40	100	1
BECE3-413	Instrumentation Lab.	0	0	2	60	40	100	1
BECE4-414	Microprocessor 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/ BECE3-301 **L T P C** **3 1 0 4** **Duration: 48 Hrs.**

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.

DIGITAL ELECTRONICS

Subject Code: BECE1-303/BECE2-303/ BECE3-302 **L T P C** **3 1 0 4** **Duration: 48 Hrs.**

Learning Objectives

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

Learning Outcomes

1. An ability to understand all types of combinational & sequential digital circuits and their designing.
2. Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.
3. To understand various sequential circuits & various Digital Logic families
4. 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.

ELECTRICAL MEASUREMENTS & INSTRUMENTS

Subject Code: BECE3-303 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:
1. To aware the students about the basics of Measurements and Instrumentation systems.
2. To impart knowledge about different instruments for electrical parameters.
3. To provide them basic concepts of different types of sensors and transducers.

Learning Outcomes:
1. After the completion of course, students will be having skills to design, analyze and instruments.
2. Gain the skill knowledge of bridges and CRO operations.

UNIT I (12 Hrs.)

Introduction to measuring techniques, Necessity of measurements, block diagram of measurement system, Types of instruments, classification of standards, Fundamental Unit and Derived units. Instrument Characteristics; accuracy and precision, indications of precision, repeatability, Threshold, Sensitivity and span. Different types of errors in measurement, relative errors, limiting errors. Gross error, systematic errors, random error, Observational error, statistical analysis of data, arithmetic mean, deviation, average and standard deviation, probable error.

UNIT II (12 Hrs.)

Principle of operation and Constructional Features; D'Arsonval Galvanometer, Moving Coil PMMC & Moving Iron instrument (Repulsion and Attraction type), Electrodynamic instruments, Electrostatic instruments and Thermoelectric Instruments. Range Extension of Voltmeter and Ammeter (Without Mathematical Derivations).

UNIT III (12 Hrs.)

DC potentiometers; Basic potentiometer circuit, Compton type & multiple range potentiometer, constructional details & precision type potentiometers & their applications, AC potentiometer. Measurement of Power using two Wattmeter and three Wattmeter methods, Q meter.

UNIT IV (12 Hrs.)

Measurement of Resistance; Low, Medium and High using; Kelvin Double Bridge, Ammeter-Voltmeter method, substitution method, Wheat Stone Bridge, Loss of Charge and Megger. Measurement of Inductance and Capacitance using; Maxwell Inductance, Hay's, Anderson and Schering Bridges. Measurement of frequency by Wein bridge method.

Recommended Books:
1. Cooper Halfrick, 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990**.
2. A.K. Sawhney, 'Electronic Instrumentation & Measurement', 19th Edn., Dhanpat Rai & Sons., **2011**.
3. Jones & Chin., 'Electronic Instruments and Measurement', 2nd Edn., **2010**.
4. J. Toppin, 'Theory of Errors', 4th Edn., Wessely Publishing, **2009**.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: ECE3-304 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:
1. To aware the students about the basics of networks.

2. To provide them basic concepts of different types of network theorems & their applications.
3. To impart knowledge about different circuits, analyzing and synthesizing methods of circuits.

Learning Outcomes:

1. After the completion of course, students will be having skills to design, analyze and synthesize the circuits.
2. Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.

UNIT-I (12 Hrs.)

Circuit Concepts: Circuit elements; Independent and dependent sources, source transformation theory, Mesh & Nodal Analysis: Loop currents and loop equations, node voltages and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum power Transfer, Tellegen's, Reciprocity.

UNIT-II (12 Hrs.)

Network Functions: Terminal pairs or ports, network functions for one-port and two-port networks, pole and zeros of network functions, restrictions on pole and zero locations for driving point functions and transfer functions, time domain behavior from pole-zero plots. Stability criteria of active networks.

UNIT-III (12 Hrs.)

Transient Response: Transient Response of RC, RLC, RL circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform. Network synthesis techniques for two terminal network, foster and cauer form of synthesis.

UNIT-IV (12 Hrs.)

Fundamental of filters, filter networks, equation of filter network, classification and characteristic impedance of low-pass, high-pass, band-pass & band-reject, constant K filters, m – derived. Network synthesis: Hurwitz Polynomial, positive real functions, synthesis of one port and two port networks, elementary idea of active networks and frequency response.

Recommended Books:

1. A. Sudhakar & S.P. Shyammohan, 'Network Analysis', 2nd Edn., TMH, **1994**.
2. Van Valkenburg, 'Introduction to Modern Network Synthesis', 1st Edn., PHI, **1960**.
3. Van Valkenburg, 'Network Analysis', 6th Edn., PHI, **1974**.
4. G.K. Mithal, 'Network Analysis', 5th Edn., Khanna Publication, **2008**.
5. D. Roy Choudhury, 'Networks and Systems', 2nd Edn., New Age Pub., **2009**.

ELECTRONIC DEVICES AND CIRCUITS LAB. - I

Subject Code: BECE1-305/BECE2-305/ BECE3-305 **L T P C 0 0 2 1**

Learning Objectives

1. To understand the Characteristics of various semiconductor devices and construction of different electronic circuits using the above devices.
2. 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.
3. Able to understand identification and selection of various electronic components.

Learning Outcomes

1. An ability to understand all types of electronics devices and circuits
2. 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/ BECE3-306 **L T P C 0 0 2 1**

Learning Objectives

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

Learning Outcomes

1. An ability to understand all types of combinational & sequential digital circuits and their designing.
2. 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.

LINEAR CONTROL SYSTEM

Subject Code: BECE3-408 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:

1. To obtained transfer functions for electrical circuits, translational/rotational mechanical systems and electromechanical systems.
2. To learn basic goals of control systems in terms of transient/steady state time response behaviour.
3. To update the knowledge about control components.

Learning Outcomes:

1. After the completion of the course, the students could have skills about the basics to model the control systems.
2. An ability to analyze the stability of designed systems

UNIT I (12 Hrs.)

Introduction to control systems; open loop and closed Loop systems-, Electrical to Mechanical and Mechanical to Electrical analogy. Block diagram reduction, Signal flow diagram & Meson`s gain formula

Time response analysis: Analysis of Test signals; step. Impulse, & ramp. Analysis of Zero, first & second order systems. Steady state errors, design of second order systems. Stability of control system, Routh Hurwitz's stability criterion, static and dynamic errors coefficients, errors criteria.

UNIT II (12 Hrs.)

Introduction of Root Locus method; Root Locus plots, Rules for constructing root loci, stability analysis of systems using Root locus, concept of dominant, closed loop pole pair, Root contour plots, effect of addition of zeros & poles on root loci

UNIT III (12 Hrs.)

Introduction of frequency response, bode plots, log magnitude versus phase plots, stability margins on the Bode plot, stability analysis of systems using Bode plots, polar plots, Nyquist stability criterion, relative stability.

UNIT IV (12 Hrs.)

Concept of state, state space representation of systems, conversion of state variable models to transfer functions, conversion of transfer functions to state variable models, solution of state equations. controllability & observability.

Recommended Books:

1. Kuo, 'Automatic Control System', Princeton Univ. Press. Edition, **2010.**
2. D'Azzo and Houpis, 'Feedback Control System', McGraw Hill Pub. International Edition, **2010.**
3. Oagata, 'Modern Control Engineering', Prentice Hall Pub. Reprint, **2009.**
4. Nagrath & Gopal, 'Control Systems Engineering', New Age International Pub., **2011.**

TRANSDUCERS & SENSORS

Subject Code: BECE3-409 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:
The main aim of this course is to understand the role of sensors and transducers for different communication systems. In this different transducers for Temperature, pressure, Liquid level measurement will be discussed in detail.

Learning Outcomes:
For different process control industries sensors and transducers play a vital role. For DCS, SCADA or PLC operation basic idea about measurement will be boosted in the students.

UNIT-I (12 Hrs.)

Introduction to transducers and their classifications.

Pressure transducers: Manometers, Elastic transducers, High Pressure transducers, Mcloed Gauge, Pirani-gauge, Ionization gauge, Knudsen Gauge, pressure smart transmitters.

Temperature Transducers: Resistive transducers (Platinum Resistance Thermometer), Thermistor, Thermoelectric sensors, Solid-state Sensors & Pyrometers.

UNIT-II (12 Hrs.)

Flow Transducers: Classification of flow meter, Volume flow Sensors (orifice, Nozzle, Venture, Pitot type) Turbine type, Rotometers, Anemometers, Ultrasonic, Mass flow meters, Positive displacement type flow-meter, Open channel flow measurement, E.M. Flow-meter.

Level Transducers: Thermal effect type, Electric methods (Resistive method, Conductance probe method, Inductive level gauging and capacitive method), Ultrasonic method.

UNIT-III (12 Hrs.)

Force Transducers: Load Cell, Hydraulic Load Cell Torque Transducers: Absorption type, transmission Type, Stress Type, Deflection type.

Acoustics sensors: ceramic microphones, capacitor microphones, electric microphones, magnetic microphone, Humidity sensors: Hair hygrometer, electrode hygrometer, moisture sensors.

UNIT-IV (12 Hrs.)

Introduction to sensors. **Nano & Bio Sensors**: Structure of Protein, role of protein in nanotechnology, using protein in nanodevices, antibodies in sensing, antibody in nano particle conjugates, enzymes in sensing, enzyme nanoparticle hybrid sensors, Motor proteins in sensing, transmembrane sensors, Nan sensors based on Nucleotides and DNA; Structure of DNA, DNA decoders and microarrays; DNA protein conjugate based sensors, Bioelectronic sensors, biomagnetic sensors.

Recommended Books

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai & Sons.
2. Douglas M. Considine, 'Process/Industrial Instruments & Controls Handbook', 6th Edn., McGraw Hill.
3. H.S. Kalsi, 'Electronic Instrumentation', TMH.
4. J.B. Gupta, 'Electrical, Electronics Measurement & Instrumentation', S.K. Kataria & Sons.
5. Kouroush Kalantar – Zadeh, Benjamin Fry, 'Nanotechnology enabled Sensors', Springer Verlag, New York, **2007**, ISBN-13: 978038732473.
6. D.V.S. Murthy, 'Transducers and Instrumentation', PHI, **2004**.

ELECTRICAL & ELECTRONICS INSTRUMENTATION

Subject Code: BECE3-410 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:
The subject aims to enrich the students about different analog and digital instruments of electrical and electronics domain. To understand various measurements with different instruments.

Learning Outcomes:
Subject will provide skills about handling different instruments. They will be able to measurement various unknown signals.

UNIT I (12 Hrs.)

Oscilloscope: Basic principle & construction, CRT, sweep modes, applications in measurement of voltage, freq. (Lissajous pattern), Dual Trace Oscilloscope, sweep modes, active, passive probes, delay line, analog storage oscilloscope, principle of secondary emission, Digital Storage Oscilloscope, sampling rate, sampling oscilloscope, application of the CRO in instrumentation and measurement, sampling oscilloscope. Comparison between analog and digital oscilloscope,

UNIT II (12 Hrs.)

Wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, applications of wave analyzer, Distortion analyzer, spectrum analyzer. **Digital Voltmeter**: Types of DVM; Ramp, Integrating, Successive approximation and Atomization in DVM. **Digital Frequency Meter**: Basic circuit, Frequency Measurement Circuit, High Frequency Measurement.

UNIT III (12 Hrs.)

Recorders: Strip Chart Recorders, X-Y Recorders, Ultraviolet Recorders, Magnetic Tape Recorders.
Display Devices: Digital display methods, Seven Segment LED display, Dot Matrix display and LCD Display.
Nuclear Instrumentation: Geiger Muller Tube, Ionization Chamber, Scintillation Counter.

UNIT IV (12 Hrs.)

Basic Concept of measurement system, Transducer and its classifications, basic requirements of Transducer/Sensors. Displacement Transducers: LVDT, RVDT and Piezo Electric. Resistance Thermometer, Thermistors, Thermocouples and Strain Gauge Transducer: Basic principle of operation of Resistance strain gauge.

Recommended Books:

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', 4th Edn., Dhanpat Rai & Sons, **2012**.
2. Douglas M. Considine, 'Process/Industrial Instruments & Controls Handbook', 4th Edn., McGraw Hill, **2009**.
3. H.S. Kalsi, 'Electronic Instrumentation', 3rd Edn., TMH, **2010**.
4. J.B. Gupta, 'Electrical, Electronics Measurement & Instrumentation', 3rd Edn., S.K. Kataria & Sons, **2011**.

MICROPROCESSORS & PERIPHERAL DEVICES

Subject Code: BECE3-411 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Objectives:
This course aims to provide detailed description of 8-bit microcontrollers, its architecture, programming, and interfacing. This course also briefly introduce the Next focus is to get student familiarize with architecture and programming of microcontrollers. Besides that, embedded systems are introduced.

Learning Outcomes:
1. The students will acquire teaching skills about embedded life
2. They will be able to control various hardware devices with software.
3. Students will learn interfacing skills for different devices

UNIT-I (12 Hrs.)

Introduction:
Introduction to microprocessor, Intel 8085 microprocessor architecture and its operations, various functions, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Comparative study of 8-bit microprocessors: 8085, Motorola 6800, Zilog Z-80.

UNIT-II (12 Hrs.)

Programming with 8085
Addressing modes, Bus timings, T state, machine cycle, timing diagram, Detail study of 8085 instruction set. Memory mapping. Interrupt: necessity, types and structure, stack and subroutines, Programming techniques: looping, counting. Efficient programming in view of memory and speed.

UNIT-III (12 Hrs.)

Interfacing with 8085:
Concept of programmable devices, architecture and programming of 8155/8156 (programmable I/O port timer), 8254/8253 (programmable interval timer), 8255 (programmable peripheral interface), its interfacing with 8085 microprocessors. 8279 (keyboard display controller), 8237 (direct memory access controller), 8251(universal synchronous, asynchronous receiver transmitter) with 8085 microprocessor

UNIT-IV (12 Hrs.)

8086 Microprocessor:
Block diagram, Architecture & Pin diagram of 8086, pipelining process, flag register. Register details of 8086, operation, different addressing modes.

Recommended Books
1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications with the 8085', 5th Edn., Penram International Pub., **2009**.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware', 3rd Edn., McGraw Hill Co, **2012**.
3. Intel Data Books.

ANTENNA & WAVE PROPAGATION

Subject Code: BECE1-456/BECE2-456/ BECE3-456 **L T P C** **3 0 0 3** **Duration: 34 Hrs.**

Learning Objectives

1. 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.
2. Study of physical concept of radiation patterns and all the important Fundamental Parameters of antennas with antenna Arrays in the antenna terminology

Learning Outcome

1. An ability and development of skill of students to design highly effective communication system.
2. After completion of the course, students will be aware with the various performance parameters of the antenna system design and antenna arrays.
3. Understand various types of antennas such as micro strip and Yagi-uda antennas.
4. 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/ BECE3-457 **L T P C 3 0 0 3** **Duration: 34 Hrs.**

Learning Objectives

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

Learning Outcomes

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

1. Explain the concepts of algorithms, trees and graphs.
2. Write simple applications of data structures.
3. 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/ BECE3-458 **L T P C** **3 0 0 3** **Duration: 34 Hrs.**

Learning Objectives

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

Learning Outcomes

1. Able to understand operation of different instruments and able to describe different terminology related to measurements.
2. A recognition and understanding of various analog measuring instruments.
3. 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/ BECE3-459 **L T P C** **3 0 0 3** **Duration: 34 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.

Learning 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.**

CONTROL SYSTEM LAB.

Subject Code: BECE3-412 **L T P C**
0 0 2 1

Learning Objectives:

1. To understand the basics of MATLAB software.
2. To introduce variety of control system strategies.
3. To comment about the stability of designed systems.

Learning Outcomes:

1. To acquire skills to understand all types of control components
2. An ability to analyze the stability of control systems

LIST OF EXPERIMENTS

1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox
2. Determination of step response for first order & second order system with unity feedback and their display on CRO. Calculation and verification of time constant, peak overshoot, setting time etc. from the response.
3. To locate ploe zero locations of a control system.
4. Determination of Root Locus of a control system
5. Determination of Bode plot of a control system.
6. Determination of Nyquist Plot of a control system
7. Evaluation of steady state error, setting time, percentage peak overshoot, gain margin, phase margin, with addition of lead compensator & by compensator in forward path transfer function for unity feedback control system.
8. Determination of control system specifications for variations of system parameters in practical position control system.
9. Design of a second order linear time invariant control system and study of system response with unit step input.
10. To study the characteristics of potentiometers and to use 2- potentiometers as an error detector in a control system.
11. To study the synchro Transmitter-Receiver set and to use it as an error detector
12. To study the Speed – Torque characteristics of an AC Servo Motor and to explore its applications.
13. To study the Speed – Torque characteristics of a DC Servo Motor and explore its applications.
14. To study various electro-mechanical transducers i.e. resistive, capacitive and inductive transducers
15. To study a LVDT (AC-AC, DC-DC) as a transducer and its processing circuits
16. To obtain the transfer function of a D.C. motor – D.C. Generator set using Transfer Function Trainer.

INSTRUMENTATION LAB.

Subject Code: BECE3-413 **L T P C**
0 0 2 1

Learning Objectives:

1. To understand the working principal and construction of the measuring instruments and recorders.
2. To measuring various electrical parameters using meters and transducers.
3. To calibrate the measuring devices such as meters and transducers.

Learning Outcomes:

1. After the completion of the course, the students could have skills about the basic measurement circuits, their operational characteristics and their applications.
2. An ability to use the techniques and skills to CRO.

LIST OF EXPERIMENTS

1. Study of principle of operation of various types of electromechanical measuring instruments.
2. To measure high value of DC current and voltage using shunt and Multiplier.
3. To measurement of low resistance using wheat stone bridge.
4. To measure active and reactive power in 3-phase balanced load by one wattmeter method.
5. To measure the active power in 3-phase balanced and unbalanced load by two wattmeter method and observe the effect of power factor variation on wattmeter reading.
6. To study and calibrate Energy Meter.
7. Measurement of resistance using Kelvin's Bridge.
8. Measurement of self-inductance using Anderson's Bridge.
9. Measurement of capacitance using Schering Bridge.
10. Plotting of Hysteresis loop for a magnetic material using flux meter.
11. Measurement of frequency using Wein's Bridge.
12. To study the connections and use of Current and Potential transformers and to find out ratio error.
13. Determination of frequency and phase angle using CRO.
14. Measurement of unknown voltage using potentiometer.

MICROPROCESSOR LAB.

Subject Code: BECE3-414 **L T P C**
0 0 2 1

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8086.
9. Write a program to find maximum and minimum from series using 8086.
10. Write a program to control the operation of stepper motor using 8085/8086 microprocessors and 8255 PPI.

11. Write a program to control speed of DC motor using 8085/8086 microprocessors and 8255 PPI