B. TECH. ELECTRONICS & COMMUNICATION 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**	
BECE1-301	Object Oriented Programming	3	1	0	40	60	100	4
BECE1-302	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE1-303	Network Analysis and Synthesis	3	1	0	40	60	100	4
BECE1-304	Electronic Instrumentation	3	1	0	40	60	100	4
BECE1-305	Signals and Systems	3	1	0	40	40	100	1
BECE1-306	Electronic Devices and Circuits - I Lab.	0	0	2	60	40	100	1
BECE1-307	Object Oriented Programming Lab	0	0	2	60	40	100	4
BSOS0-F91	Soft Skills-I	0	0	2	60	40	100	1
BECE1-308	Training – I#	0	0	4	60	40	100	2
Total		**15**	**5**	**10**	**440**	**460**	**900**	**25**

After 2nd Sem, During Summer Vacation

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**	
BECE1-409	Electronic Devices and Circuits –II	3	1	0	40	60	100	4
BECE1-410	Analog Communication Systems	3	1	0	40	60	100	4
BECE1-411	Digital Electronics	3	1	0	40	60	100	4
BECE1-412	Electromagnetic Field Theory	3	1	0	40	60	100	4
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BECE1-456	Neural Networks and Fuzzy Logic							
BECE1-457	Data Structures and Algorithms							
BECE1-458	RADAR and SONAR Engineering							
BECE1-459	Web Technologies							
BECE1-413	Electronic Devices and Circuits -II Lab.	0	0	2	60	40	100	1
BECE1-414	Analog Communication Systems Lab.	0	0	2	60	40	100	1
BECE1-415	Digital Electronics Lab.	0	0	2	60	40	100	1
BSOS0-F92	Soft Skills -II	0	0	2	60	40	100	1
Total		**15**	**4**	**8**	**440**	**460**	**900**	**23**

In House / Industrial Training of 6 Weeks during Summer vacations after 4th semester

Total Contact Hrs. = 30 **Total Marks = 1000** **Total Credits = 24**

Semester 5th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-516	Linear Integrated Circuits	3	1	0	40	60	100	4
BECE1-517	Microprocessor and Interfacing	3	1	0	40	60	100	4
BECE1-518	Digital Communication Systems	3	1	0	40	60	100	4
BECE1-519	Linear Integrated Circuits Lab.	0	0	2	60	40	100	1
BECE1-520	Microprocessor Lab.	0	0	2	60	40	100	1
BECE1-521	Digital Communication Systems Lab.	0	0	2	60	40	100	1
BECE1-522	Training –II#	0	0	4	60	40	100	2
BSOS0-F93	Soft Skills -III	0	0	2	60	40	100	1
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BECE1-560	Data Communication Networks							
BECE1-561	Human Resource Management							
BECE1-562	Digital System Design							
BECE1-563	Biomedical Electronics and Instrumentation							
BECE1-564	Micro-electronics							
Open Elective – I		3	0	0	40	60	100	3
Total		**15**	**3**	**12**	**500**	**500**	**1000**	**24**

After 4th Sem, During Summer Vacation

Total Contact Hrs. = 24 **Total Marks = 800** **Total Credits = 21**

Semester 6th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-623	Microwave and Antenna Theory	3	1	0	40	60	100	4
BECE1-624	Microcontroller and Embedded System	3	1	0	40	60	100	4
BECE1-625	Linear Control System	3	1	0	40	60	100	4
BECE1-626	Microwave Engineering lab	0	0	2	60	40	100	1
BECE1-627	Microcontroller Lab.	0	0	2	60	40	100	1
BSOS0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Departmental Elective-III (Select any one)		3	0	0	40	60	100	3
BECE1-665	Nano Science and Nano-Technology							
BECE1-666	Advanced Microprocessor							
BECE1-667	Image and Speech Processing							
BECE1-668	Optical Fibre Communication							
BECE1-669	Operation Research							
Open Elective – II		3	0	0	40	60	100	3
Total		**15**	**3**	**6**	**380**	**420**	**800**	**21**

In House / Industrial Training of 8 Weeks during summer vacations after 6th semester

Total Contact Hrs. = 28 Total Marks = 700 Total Credits = 23

Semester 7th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1- 728	Wireless Communication Systems	3	1	0	40	60	100	4
BECE1- 729	Digital Signal Processing	3	1	0	40	60	100	4
BECE1- 730	Digital Signal Processing Lab	0	0	2	60	40	100	1
BECE1- 731	Minor Project	0	0	4	60	40	100	4
BECE1- 732	Training-III#	0	0	8	60	40	100	4
Departmental Elective-IV (Select any one)		3	0	0	40	60	100	3
BECE1-770	Cognitive Radio							
BECE1-771	Relational Data Base Management System							
BECE1-772	Computer Architecture and Organization							
BECE1-773	Soft Computing							
Open Elective – III		3	0	0	40	60	100	3
Total		**12**	**2**	**14**	**340**	**360**	**700**	**23**

After 6th Sem, During Summer Vacation

Total Contact Hrs. = 21 Total Marks = 400 Total Credits = 14

Semester 8th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1- 833	VLSI Design	3	1	0	40	60	100	4
BECE1- 834	VLSI Design Lab	0	0	2	60	40	100	1
BECE1- 835	Major Project	0	0	12	60	40	100	6
Departmental Elective-V (Select any one)		3	0	0	40	60	100	3
BECE1-874	Cellular and Mobile Communication							
BECE1-875	Wireless Sensor Networks							
BECE1-876	Information Theory and Coding							
BECE1-877	Operating Systems							
BECE1-878	Satellite Communication							
Total		**6**	**1**	**14**	**200**	**200**	**400**	**14**

Total Credits

Semester	Credits
I	25
II	25
III	25
IV	23
V	24
VI	21
VII	23
VIII	14
Total	**180**

OBJECT ORIENTED PROGRAMMING

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

Course Objectives:

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

Course Outcomes:

1. After undergoing the course students will be able to develop various programs and flow charts using C++.
2. Apply the concepts of data encapsulation, inheritance, and polymorphism to large-scale software.
3. Enable students to develop their skills in programming with C++.
4. Design and develop object-oriented computer programs.

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 constkeyword, 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, need for destructors.

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, object composition and delegation, order of execution of constructors and 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.

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

Recommended Books:

1. I.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.
4. 'The Complete Reference to C++ Language', McGraw Hill-Osborne.
5. F.B. Lippman, 'C++ Primer', Addison Wesle.

ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code: BECE1-302 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

This course is meant to provide fundamental knowledge to students for understanding of the various electronic devices, their circuits & behaviour under various conditions.

1. To aware the students about the various electronic devices and their circuits.
2. To impart knowledge of BJTs and FETs.
3. To provide the students detailed concepts of CMOS and MOSFET.
4. To analyze low and high frequency transistor models.

Course Outcomes:

After undergoing this course student will be able to:

1. Understand the concepts of junction diodes and their applications.
2. Analyze BJT characteristics and determine their behaviour under low and high frequencies.
3. Analyze various concepts of FETs and their characteristics.
4. Design low and high frequency models and observe and its various characteristics.

Unit-I (12 Hrs.)

Semiconductor Diodes: Semi-conductor materials and their characteristics, PN junction Diode - VI characteristics, Breakdown mechanism in diode, effect of temperature on diode 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', Pearson Education.
4. Sedra, Adel S. and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: BECE1-303 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To provide the knowledge to students about the various network theorems.
2. To make the students aware about the various transient responses for various signals.
3. To provide them basic concepts of different types of two port networks and their synthesis.
4. To impart knowledge about different passive filter design.

Course Outcomes:

1. An ability to design, analyze and synthesis of various networks and circuits.
2. Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.
3. Synthesis of networks using fundamental concepts.
4. To understand, design and analysis of various passive filter design.

Unit-I (12 Hrs.)

Laws and Basic Theorems: Fundamental Laws and Concepts – Kirchoff'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: K-derived, m-derived, Low pass filter, High pass filter, Band pass filter, Band stop filter, their magnitude and phase response

Recommended Books:

1. Vanvalkenburg, 'Network Analysis', Prentice Hall of India Pvt. Ltd., New Delhi.
2. D. RoyChoudhary, 'Network and Systems', New Age International Publisher.
3. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley.
4. Someshwar C. Gupta, 'Circuit Analysis - with Computer Applications to Problem Solving', Jon W. Bayless.

ELECTRONIC INSTRUMENTATION

Subject Code: BECE1-304 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about different types of measuring, waveform generation, and analysis of electronic instruments.
2. Exposure to various analog measuring instruments.
3. To provide detailed knowledge about different bridges.
4. To understand CRO and its operation.

Course Outcomes:

After undergoing this course student will be able to:

1. Analyze operation of different instruments and able to describe different terminology related to measurements.
2. Recognize and understand various analog measuring instruments.
3. Measure resistance using various methods.
4. Find various measurements using 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 & Publishers.
2. J.B. Gupta, 'A Course in Electrical and Electronics Measurement & Instrumentation', S.K. Kataria & Sons.
3. W.D. Cooper1, 'Electronic Instrumentation and Measurement Techniques', Prentice Hall.

SIGNAL AND SYSTEMS

Subject Code: BECE1-305 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To make the students aware about the signal transmission through linear networks
3. Tobe able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
4. To impart them knowledge of various types of noises.

Course Outcomes:

1. Ability to analyse various types of signals in communication system.
2. Developing skills to understand random signals.
3. To understand various types of noises.
4. 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 Systems', Oxford University Press.
2. Ravi Kumar, 'Signals and Systems', PHI Learning.
3. Simon Haykin, 'Signals and Systems', John Wiley.
4. George R. Cooper, 'Probabilistic Methods of Signals and System Analysis', Oxford University Press.

ELECTRONIC DEVICES AND CIRCUITS LAB. - I

Subject Code: BECE1-306 **L T P C** **Duration: 24 Hrs.**

0 0 2 1

Course Objectives:

1. Able to understand and identification of various electronic components.
2. To understand and plot characteristics of various semiconductor devices.
3. To understand the applications of Transistors as amplifier in various configurations.

Course Outcomes:

1. An ability to understand all types of electronics devices and circuits
2. An ability to conduct experiments, as well as to analyze and interpret various data sheets.

EXPERIMENTS

1. To perform & analyze the use of Zener diode as voltage regulator.
2. To observe the characteristics and behavior of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To observe the characteristics of a Class- A amplifier.
5. To observe the characteristics of Class- B amplifier.
6. To observe the characteristics of Class- B push-pull amplifier.
7. To observe 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 Observe 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 perform an experiment to observe the working of BJT as an amplifier.

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

OBJECT ORIENTED PROGRAMMING LAB.

Subject Code: BECE1-307 **L T P C** **0 0 2 1** **Duration: 24 Hrs.**

Course Objectives:

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

Course Outcomes:

1. Enable students to develop their skills in programming with C++.
2. To describe functions of creating constructors, destructor, inheritance, polymorphism and file handling programs
3. Formulate problems as steps so as to be solved systematically.
4. Integrate robustness, reusability, and portability into large-scale software development.

EXPERIMENTS

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 parameterized constructors.
6. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
7. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
8. [Initializer Lists] Write a program to demonstrate the use of initializer list.
9. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
10. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
12. [Typecasting] Write a program to demonstrate the typecasting of basic type to class type.
13. [Typecasting] Write a program to demonstrate the typecasting of class type to basic type.
14. [Typecasting] Write a program to demonstrate the typecasting of class type to class type.
15. [Inheritance] Write a program to demonstrate the multilevel inheritance.
16. [Inheritance] Write a program to demonstrate the multiple inheritances.
17. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
18. [Polymorphism] Write a program to demonstrate the runtime polymorphism.

19. [Exception Handling] Write a program to demonstrate the exception handling.
20. [Templates and Generic Programming] Write a program to demonstrate the use of function template.
21. [Templates and Generic Programming] Write a program to demonstrate the use of class template
22. **[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,
23. **[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.

ELECTRONIC DEVICES AND CIRCUITS - II

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

Course Objectives:

1. To aware the students about Basic Electronic Circuits.
2. To update the Knowledge about small signal & large signal amplifier.
3. To analyze various types of circuits to generate signals.
4. Selection and specification of electronic components for industrial applications.
5. To understand working of switching circuits.

Course Outcomes:

1. After the completion of the course, the students could have learnt about the basic Electronic Circuits, their operational characteristics and their applications.
2. To generate ability to understand various amplifiers including push pull and complementary symmetry.
3. Design different types of feedback amplifiers and oscillator circuits.
4. To understand and analyze 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. Analysis of R_i, R_o, A_i, A_v with and without feedback

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

Unit-IV (12 Hrs.)

A Stable Multivibrators: A stable Collector coupled and emitter coupled multivibrator, complementary Transistor A stable multivibrator.

Switching Characteristics of Devices: Diode and transistor as electronic switch.

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', Pearson Education.
4. Sedra, S. Adel and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

ANALOG COMMUNICATION SYSTEMS

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

3 1 0 4

Course Objectives:

1. To understand various wave propagation concepts.
2. To provide the students about the concepts of analog modulation techniques
3. To provide the detailed knowledge about AM transmission and AM reception
4. To impart the knowledge about FM transmission and FM reception.

Course Outcomes:

1. An ability to learn analog communication system and modulation techniques
2. An ability to understand design of useful circuits required in analog communication system.
3. An ability to explore working of transmitter and receiver circuits used in communication.
4. To analyze the performance of AM/FM transmission and reception.

Unit-I (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, Concepts of VSB/ISB/SSB, Pre-emphasis and De-emphasis.

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.

Unit-II (12 Hrs.)

AM Transmission/AM Reception: Introduction, Generation of Amplitude Modulation, Basic Principles of AM Generation: Square law Diode 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-III (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 Seeley or Phase Discriminator, Indirect methods of FM Demodulation: FM Detector using PLL and Stereo FM Multiplex Reception.

Unit-IV (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.

Recommended Books:

1. George Kennedy, 'Electronic Communication System', McGraw Hill.
2. Gary M. Miller and Jeffery S. Beasley, 'Modern Electronic Communications', PHI.
3. Simon Haykin, 'Communication Systems', \Wiley.
4. Wayne Tomasi, 'Electronics Communication systems', Pearson Publishers.
5. Proakis, 'Communication Systems', McGraw Hill.

DIGITAL ELECTRONICS

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

3 1 0 4

Course 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

Course Outcomes:

1. Students will simplify a digital design problem as part of the systematic approach to solve a problem.
2. To analyze and understand various sequential circuits & various Digital Logic families.
3. To design 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.

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-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.

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 Book:

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', Tata McGraw Hill.

ELECTROMAGNETIC FIELD THEORY

Subject Code: BECE1-412 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course 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 and all the important fundamental parameters of transmission lines and waveguides.

Course Outcomes:

1. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
2. An ability to understand the concepts of magnetic field and magnetic field intensity.
3. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
4. 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 law and its applications, Electric flux density, potential fields due to electric dipole, Laplace and Poison equations.

Magneto statics: Definition and explanation on Magnetic Field intensity due to a finite and infinite wire carrying current. Magnetic field intensity on rectangular loop carrying current, Amperes 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. N. Narayana Rao, ''Elements of Engineering Electromagnetics', Pearson Education.
4. R.F. Jordan, 'Electromagnetic Waves & Radio System', Prentice Hall India.
5. Bhag Singh Guru and Hüseyin R. Hiziroglu, 'Electromagnetic Field Theory Fundamentals, Cambridge University Press.

ELECTRONICS DEVICES AND CIRCUITS LAB - II

Subject Code: BECE1-413 **L T P C** **Duration: 24 Hrs.**

0 0 2 1

Course Objectives:

1. To understand the characteristics of various semiconductor devices
2. To understand various sources of oscillations
3. Able to understand, identification and selection of various amplifiers.
4. To make the students aware about the various multivibrator circuits.

Course Outcomes:

1. An ability to understand different types of electronics devices and circuits
2. An ability to design and conduct experiments, as well as to analyse and interpret output.

EXPERIMENTS

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 observe the response of RC phase shift oscillator and determine frequency of oscillation.
5. To observe the response of Hartley oscillator and determine frequency of oscillation.
6. To observe the response of Colpitt's oscillator and determine frequency of oscillation.
7. To observe 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 JFET as an amplifier.
10. To understand and plot working of Astable Multivibrator.
11. To understand and plot working of Monostable Multivibrator.

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

ANALOG COMMUNICAION SYSTEM LAB

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

Course Objectives:

1. To familiarize with modulation & demodulation techniques and study their waveforms on oscilloscope.
2. To impart working knowledge of Voltage Controlled Oscillator.
3. To familiarize students with the functions of oscillators, filters, amplifiers, LC networks, modulators, limiters, mixers, and detectors in AM, FM, PM, SSB, and PLL circuits.

Course Outcomes:

1. An ability to perform transmission of signals from transmitter to receiver using various analog
   modulation and demodulation techniques.
2. Study of transmission and reception process.

EXPERIMENTS

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.

DIGITAL ELECTRONICS LAB

Subject Code: BECE1-415 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To give students a practical knowledge about all types of digital circuits.
2. To give students a working knowledge to connect digital circuits and verify their truth tables.
3. To give students a knowledge about integrated circuits of different combinational and sequential circuits.

Course Outcomes:

1. An ability to test and verify working and truth tables of combinational and sequential circuits.
2. Working knowledge of different converters.
3. To perform multiplexer and demultiplexer.

EXPERIMENTS

1. To Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and their Realization of OR, AND, NOT and XOR functions using universal gates.
2. To Realize of Half Adder using Logic gates.
3. To Realize of Full Adder using Logic gates.
4. To Realize of Half Subtractor using Logic gates
5. To Realize of Full Subtractor using Logic gates
6. To Design 4-Bit Binary-to-Gray Code Converter.
7. To Design 4-Bit Gray-to-Binary Code Converter.
8. To study and design 4-Bit magnitude comparator using logic gates.
9. To study and design multiplexer Truth-table and their verification.
10. Realization of Half adder and Full adder using MUX.
11. To study and design Demultiplexer Truth table and their verification
12. Realization of Half subtractor and Full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers, viz. SIPO, SISO, PIPO, PISO.

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

NEURAL NETWORKS AND FUZZY LOGIC

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

Course Objectives:

The students should be made to:

1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn about the concepts of Fuzzification and De-Fuzzification.

4. Describe various optimization techniques.

Course Outcomes:

Students will be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic and Fuzzy rules.
4. Learn and understand various optimization techniques.

UNIT-I (12 Hrs.)

Neural Networks: History, Overview of Biological Neuro-System, Terminology of Artificial Neural Network, Comparison of BNN and ANN, Mathematical Models of Neuron, ANN Architecture, Topology, Fundamental Learning Laws, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning.

UNIT-II (12Hrs)

Perceptron Architecture: Single layer perceptron, Perceptron Learning Rules, Multi-layer perceptron, Back Propagation Algorithm, Associative Memories, Hopfield Networks, Competitive Learning, Self-organizing Maps, ART Networks, Applications of Artificial Neural Networks.

UNIT-III (12 Hrs.)

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Linguistic Variables, Membership Function, Fuzzification, De-Fuzzification to Crisp Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations, Fuzzy rule generation (IF-THEN), Applications of Fuzzy Logic.

UNIT-IV (12 Hrs.)

Neuro-Fuzzy System: Introduction and Architecture of Neuro-Fuzzy Networks.

Introduction to different Optimization Techniques: Genetic Algorithm, Particle Swarm Optimization, Biogeography Based Optimization, Bacterial Forging Optimization, Detailed study of Genetic Algorithm, GA in problem solving, Implementation of GA.

Recommended Books:

1. N. Yegnanarayana, 'Artificial Neural Network', PHI.
2. LaureneFausett, 'Fundamental of Neural Networks', Pearson.
3. Simon Haykin, 'Neural Networks', Pearson.
4. S. Rajasekaran and GA Vijayalakshmi, 'Neural Networks, Fuzzy Logic and Genetic Algorithms', PHI.
5. Timothy J. Ross, 'Fuzzy Logic with Engineering', John Wiley.
6. S.N. Sivanandam, 'Introduction to Fuzzy Logic using MATLAB', Springer.
7. Ahmad M. Ibrahim, 'Introduction to Applied Fuzzy Electronics', PHI.

DATA STRUCTURES AND ALGORITHMS

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

3 0 0 3

Course Objectives:

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

4. To understand the different methods of organizing large amount of data.

Course Outcomes:

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

1. Select basic data structures and algorithms for autonomous realization of simple programs or program parts.
2. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.
3. Demonstrate advantages and disadvantages of specific algorithms and data structures.
4. To evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

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 biconnected 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', Addison-Wesley.
4. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, 'Data Structures using C', Pearson Education.
5. Richard F. Gilberg, Behrouz A. Forouzan, 'Data Structures – A Pseudocode Approach with C', Thomson Brooks / COLE.

RADAR AND SONAR ENGINEERING

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

Course Objectives:
1. To understand theoretical principals underlying RADAR.
2. To understand the modern navigation system and general propagation phenomena.
3. Learn the fundamentals of physical acoustics and SONAR.

Course Outcomes:
1. Develop basic understanding of various types of RADARs and its applications.
2. Develop the ability to understand and design basic RADAR and SONAR systems.
3. Use of physical acoustics, electromagnetic, wireless communication and mathematics to understand fundamentals of RADAR and SONAR.

Unit-I (12 Hrs.)

Introduction to Radar: Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

Radar Equation: Simple form of Radar Equation, Prediction of Range performance, Minimum Detectable signal, Receiver noise, Signal to Noise ratio, Transmitter Power, Pulse repetition frequency &range ambiguities, System losses, Propagation effects.

Unit-II (12 Hrs.)

Continuous Wave (CW) &Frequency Modulated Radar: The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

MTI & Pulse Doppler RADAR: Introduction, Delay Line Cancellers, Multiple or staggered, Pulse repetition frequencies, Range-Gated Doppler Filters, Digital Signal Processing, Other MTI delay line, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler Radar, MTI from a moving platform.

Tracking RADAR: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range.

Unit-III (12 Hrs.)

Types of SONAR Systems: active and passive, sonar equations, propagation characteristics of the medium, transmission loss and spreading effects, beam forming and steering, detection threshold, square law detector, cross-correlation detector.

Unit-IV (12 Hrs.)

Modern SONAR systems: signal and noise models, temporal sampling and quantization-spatial sampling and beam forming, band shifting, filtering and smoothing, decision processing, block diagram of active and passive sonars.

Correlation Receivers and Matched Filters: Advanced Sonar Signal Processing functions, adaptive beam forming, synthetic aperture arrays, automated decision-making.

Recommended Books:
1. Byron’s Edde, 'Radar Principles technologies', Pearson.
2. Merrill I. Skolnik, 'Introduction to Radar Systems', Tata McGraw Hill.
3. K.K. Sharma, 'Fundamentals of Radar and Sonar Engineering', S.K. Kataria & Sons.

WEB TECHNOLOGIES

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

Course Objectives:

1. To learn the concepts of www including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user friendly web pages.
3. To define the Cascading Style Sheets(CSS) with its types and use them to provide the styles to the web pages at various levels.
4. To use the JavaScript to develop the dynamic web pages.

Course Outcomes:

After completion of the course students will be able to:

1. Describe the concepts of WWW including browser and HTTP protocol.
2. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
3. Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.
4. Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Unit-I (12 Hrs.)

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

Unit-II (12 Hrs.)

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

Unit-III (12 Hrs.)

Style Sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

Unit-IV(12Hrs.)

JavaScript: Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web.

Recommended Books:

1. Ralph Moseley and M.T. Savaliya, 'Developing Web Applications', Wiley-India.
2. Joel Sklar, 'Web Design', Cengage Learning.
3. Harwani, 'Developing Web Applications in PHP and AJAX', McGraw Hill.
4. P.J. Deitel & H.M. Deitel, 'Internet and World Wide Web How to program', Pearson.

LINEAR INTEGRATED CIRCUITS

Subject Code: BECE1-516 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the basic building blocks of linear integrated circuits.
2. To learn the linear and non-linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To learn the theory of ADC and DAC.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes:

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

1. Design linear and nonlinear applications of op – amps.
2. Design applications using analog multiplier and PLL.
3. Design ADC and DAC using op – amps.
4. Generate waveforms using op – amp circuits.
5. Analyse special function ICs.

Unit–I (10 Hrs.)

Introduction to Op–Amp: Operational Amplifier, Block diagram, analysis and its schematic symbol, interpretation of IC 741 datasheet and characteristics, practical op–amp, all important electrical parameters and their values, Op-amp applications in open loop configuration.
Concept of Feedback, Op–Amp with Negative Feedback: Introduction and Block diagram representation of feedback configurations, Voltage Series feedback amplifier, Voltage Shunt feedback and derivation of important electrical parameters.

Unit-II (14 Hrs.)

Introduction to Operational Amplifiers and Characteristics: Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations.
The Practical op-amp: Introduction, input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, transient response, interpretation of TL082 datasheet.

Unit-III (14 Hrs.)

Amplifiers and Oscillators: Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, isolation amplifiers, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO.
Active Filters: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, notch filter: all pass filters, self-tuned filters.

Unit-IV (10 Hrs.)

Advanced applications: Applications as Frequency Divider, PLL, AGC, AVC using op-AMP and analog multipliers, Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, ADC TL0820 & DAC- 7821.

Recommended Books:

1. Ramakant A. Gayakward, 'Op–Amps & Linear Integrated Circuits', Pearson Education.
2. William D. Stanley, 'Operational Amplifiers with Linear Integrated Circuits', Merrill Publishing Company.
3. Millman & Grabal, 'Micro Electronics', Tata McGraw Hill.

MICROPROCESSOR AND INTERFACING

Subject Code: BECE1-517 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To understand the basic architecture of 8 and 16-bit microprocessor.
2. To understand interfacing of microprocessor with memory and peripheral chips involving system design.
3. To understand the techniques for faster execution of instructions and improve the performance of microprocessor.
4. To understand the concepts of multi core processor.

Course Outcomes:

1. The students will able to write program to run on 8085 microprocessor based systems.
2. Design system using memory chips and peripheral chips.
3. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.

UNIT-I (10 Hrs.)

Introduction: Introduction to microprocessor, Intel 8085 microprocessor architecture and pin diagram, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Bus timings, T state, machine cycle, timing diagram, Memories- RAM, DDR/SDR, ROM, EROM, EPROM, EEPROM, Flash Memory, Cache Memory.

UNIT-II (14 Hrs.)

Programming with 8085: Addressing modes, Detail study of 8085 instruction set. I/O and Memory mapping, Interfacing I/O Devices, Interrupts, stack and subroutines, Counter and Time Delays, Code conversion, BCD Arithmetic and 16-bit data operations, Programming techniques with additional instructions, Program Debugging.

UNIT-III (14 Hrs.)

Interfacing with 8085: Architecture, interfacing and programming of 8155/8156 (programmable I/O port timer), 8251(universal synchronous, asynchronous receiver transmitter), 8253/ 8254 (programmable interval timer), 8255 (programmable peripheral interface), 8279 (keyboard display controller), and 8257 (direct memory access controller).

UNIT IV (10 Hrs.)

Other Microprocessor and interfacing: 8086 -Block diagram, Architecture, pipelining, flag register, register bank operation, memory segmentation, addressing modes. Introduction to 80186, 80286, 80386, 80486 and Pentium and their comparison, Comparative study of 8-bit microprocessors: Intel 8085, Motorola 6800, Zilog Z-80.

Recommended Books:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications with the 8085' Penram International Pub.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware', McGraw Hill Co.
3. Barry B. Brey, 'The Intel Microprocessors, Architecture Programming and Interfacing, PHI Publications.
4. B. Ram, Dhanpat Ra, 'Fundamentals of Microprocessor and Microcontrollers'.

DIGITAL COMMUNICATION SYSTEMS

Subject Code: BECE1-518 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To provide knowledge about basics of Communication system and various digital modulation and demodulation techniques.
2. To learn design of useful circuits required in communication system.
3. To provide knowledge about various transmitter and receiver circuits used in communication.
4. To provide students with tools for communication signal analysis.

Course Outcomes:

1. To understand the various blocks/stages in a digital communication system.
2. Analyze the performance of a baseband and pass band digital communication system.
3. Perform the time and frequency domain analysis of the signals in a digital communication system.
4. Analyze the performance of various multiplexing techniques.

Unit-I (10 Hrs.)

Introduction: Block Diagram of Digital Communication System, Advantages of Digital communication system over Analog communication systems, Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Bandpass Signal, Aliasing Problem, Uniform and Non-uniform quantization. Signal to Quantization ratio of Quantized Signal.

Unit-II (12 Hrs.)

Baseband Transmission: Line Coding & its properties. Various types of PCM waveforms. Attributes of PCM waveforms, M-ary Pulse Modulation waveforms, Differential pulse code modulation, Multiplexing PCM signals, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, Adaptive DPCM, Comparison of PCM and DM.

Unit-III (10 Hrs.)

Baseband Detection: rror performance degradation in communication systems, E_b/N_O parameter, Matched filter and its derivation, Inter-Symbol Interference (ISI), Nyquist criterion

for zero ISI & raised cosine spectrum, Correlation detector decision threshold and error probability for binary unipolar (on-off) signaling.

Unit-IV (16 Hrs.)

Band-pass Modulation and Demodulation: Types of digital modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques.

A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non-Coherent reception of ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Error probability for QPSK.

Multiplexing Techniques: Time division multiplexing, Frequency division multiplexing, code division multiplexing, Introduction to upcoming techniques of transmission.

Recommended Books:

1. Simon Haykin, 'Communication Systems', Wiley Publication.
2. Bernard Sklar, 'Digital Communication-Fundamentals and Applications', Pearson Education India.
3. Miller Gary M., 'Modern Electronic Communication', Prentice Hall.
4. John Proakis, 'Digital Communications', Tata McGraw Hill.
5. Wayne Tomsi, 'Electronic Communication Systems, Fundamentals Through Advanced', Pearson Education.

LINEAR INTEGRATED CIRCUITS LAB

Subject Code: BECE1-519 **L T P C** **Duration: 21 Hrs.**

0 0 2 1

Course Objectives:

1. To study the applications of op-amp as summing, scaling, averaging, instrumentation amplifiers, saw-tooth generator, zero-crossing detector and Schmitt trigger.
2. To study design of delay circuit using 555 timer and design a series regulator.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design oscillators and amplifiers using operational amplifiers.
2. Design filters using Op-amp and perform experiment on frequency response.
3. Analyze the working of voltage control oscillator.
4. Design DC power supply using ICs.

EXPERIMENTS

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. To study frequency response of an Op Amp
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.

8. Application of Op Amp as Log and Antilog amplifier. Design Low pass, High pass and Band pass 1st order butterworth active filters using Op Amp.
9. Design Phase shift oscillator using Op-Amp.
10. Design Wein Bridge oscillator using Op-Amp.
11. Application of Op Amp as Sawtooth wave generator.
12. Application of Op Amp as Zero Crossing detector and window detector.
13. Application of Op Amp as Schmitt Trigger.
14. Design a delay circuit using 555 timer.
15. Design of a function generator
16. Design of a Voltage Controlled Oscillator

Note: At least 12 experiments are required to be performed.

MICROPROCESSOR LAB.

Subject Code: BECE1-520 **L T P C** **Duration: 21 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. Introduce assembling language Programming concepts and features.
2. Write assembling language Programming for arithmetic and logical operations in 8085.
3. Differentiate Serial and Parallel Interface.
4. Interface different I/Os with Microprocessors.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write assembling language Programmes for fixed and Floating Point and Arithmetic
2. Interface different I/Os with processor.
3. Generate waveforms using Microprocessors.
4. Execute Programs in 8085.

EXPERIMENTS

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.

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

DIGITAL COMMUNICATION LAB

Subject Code: BECE1-521 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
1.To know the principles of sampling & quantization.
2.To study the various waveform coding schemes.
3.To learn the various baseband transmission schemes.
4.To understand the various Band pass signaling schemes.
5.To know the fundamentals of channel coding.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Design PCM systems.
2. Design and implement base band transmission schemes.
3. Design and implement band pass signaling schemes.
4. Analyze the spectral characteristics of band pass signaling schemes and their noise performance.

EXPERIMENTS

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation: error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

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

DATA COMMUNICATION NETWORKS

Subject Code: BECE1-560 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The students should be made to:
1. Understand the division of network functionalities into layers.
2. Be familiar with the components required to build different types of networks.
3. Be exposed to the required functionality at each layer.
4. Learn the flow control and congestion control algorithms.

Course Outcomes:
At the end of the course, the students should be able to:

1. Identify the components required to build different types of networks.
2. Choose the required functionality at each layer for given application.
3. Identify solution for each functionality at each layer.
4. Trace the flow of information from one node to another node in the network.

Unit-I (12 Hrs.)

Introduction to Data Communication: Goals and Applications of Networks, Wireless Network, Interfaces and services. Reference Models: The OSI reference model, TCP/IP reference model.

Physical Layer: Data and Signals, Digital and Analog transmission, Transmission Media, Wireless transmission, Switching.

Unit-II (14 Hrs.)

Data Link Layer: Data link layer design issues, Services provided to Network layers, Framing, Error control, Flow control, Error detection and correction, Elementary data link protocols, an unrestricted Simplex protocol, A Simplex Stop-and-Wait protocol, Simplex Protocol for a noisy channel, Sliding Window protocols, A protocol using go-back-N, A protocol using selective repeat, Example data link protocol-HDLC, PPP.

Unit-III (12 Hrs.)

Medium Access Sublayer: Channel Allocations, Random Access, ALOHA, Carrier Sense Multiple Access Protocols, Collision free Protocols, Limited contention protocols, Controlled Access, Channelization, Wired LANs: Ethernet, Wireless LANs.

Unit-IV (10 Hrs.)

Network Layer: Network Layer Design issue, Logical Addressing, Address Mapping, Error Reporting and Multicasting, Delivery Forwarding and Routing.

Transport Layer: Process to Process Delivery: UDP, TCP and SCTP.

Application Layer: Design issues of the layer, Domain Name systems, File Transfer, http, web documents, Virtual Terminals.

Recommended Books:

1. J. Frauzon, 'Computer Communication and Networks', Tata McGraw Hill.
2. W. Stallings, 'Data and Computer Communication', PHI.
3. S. Keshav, 'An Engineering Approach on Computer Networking', Addison Welsey.
4. Wayne Tomasi, 'Introduction to Data Communications and Networking', Pearson.
5. A.S. Tanenbaum, 'Computer Networks', PHI.

HUMAN RESOURCE MANAGEMENT

Subject Code: BECE1-561 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives: Understand and apply the policies and practices of the primary areas of human resource management, including staffing, training, Integration, management and compensation**.**

Course Outcomes:

1. Apply effective written and oral communication skills to business situations.
2. Analyze the global business environment.
3. Analyze the local business environment.
4. Use critical thinking skills in business situations.

5. Apply an ethical understanding and perspective to business situations.

Unit-I (12 Hrs.)

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement: Need for Human Resource Planning: Process of Human Resource Planning: Methods of Recruitment: Psychological tests and interviewing: Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970.

Unit-II (12 Hrs.)

Training & Development: Difference between training and Development: Principles of Training: Employee Development: Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job Analysis & Design: Job Analysis: Job Description & Job Description, Job Specification.

Job Satisfaction: Job satisfaction and its importance: Motivation, Factors affecting motivation, introduction to Motivation Theory: Workers ' Participation, Quality of work life.

The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961.

Unit-III (12 Hrs.)

Integration: Human Relations and Industrial Relations: Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry: Employee Employer Relationship Causes and Effects of Industrial disputes: Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective

Bargaining: Role of trade unions in maintaining cordial Industrial Relations.

Unit-I (12 Hrs.)

Maintenance: Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948: Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Recommended Books:

1. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
2. Lowin B. Flippo, 'Principles of Personnel Management', McGraw Hill.
3. R.C. Saxena, 'Labour Problems and Social Welfare', K. Math & Co.
4. A. Minappa and M.S. Saiyada, 'Personnel Management', Tata McGraw Hill.
5. C.B. Mamoria, 'Personnel Management', Himalaya Publishing House, Bombay.
6. T.N. Bhagotiwal, 'Economics of Labour and Industrial Relations', Sahitya Bhawan Agra.

DIGITAL SYSTEM DESIGN

Subject Code: BECE1-562 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
2. To introduce the concept of memories and programmable logic devices.
3. To illustrate the concept of synchronous and asynchronous sequential circuits.

Course Outcomes:

Students will be able to:

1. Design and implement Combinational circuits.
2. Design and implement synchronous and asynchronous sequential circuits.
3. Multi-input system controller design.
4. Write simple HDL codes for the circuits.

UNIT-I (12 Hrs.)

Introduction to Digital Design Concepts: Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals.

Clocked Sequential Finite State Machines: State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers.

UNIT-II (12 Hrs.)

Multi-input System Controllers Design: System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling, state assignment concepts, flip-flop level implementation using VEM's.

Sequential Design using LSI & MSI circuits: Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs).

UNIT-III (12 Hrs.)

Asynchronous Sequential Finite State Machines: Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design.

UNIT-IV (12 Hrs.)

VHDL: Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioural, dataflow and structural models.

Recommended Books:

1. William I. Fletcher, 'An Engineering Approach to Digital Design', PHI.
2. M. Morris Mano, 'Digital Design', Pearson Education.
3. Z. Navabi 'VHDL-Analysis and Modeling of Digital Systems', McGraw Hill.
4. Kevin Skahill, 'VHDL for Programmable Logic', Pearson Education.
5. Jr. Charles H. Roth, 'Fundamentals of Logic Design', Jaico Publishers.

6. John Wakerly, 'Digital Design, Principles and Practices', Pearson Education.

BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

Subject Code: BECE1-563 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

This course introduces general biological concepts:

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcomes:

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

1. Use bioinstrumentation, required in cellular or molecular biology investigations
2. Apply the concepts of engineering in different streams of biomedical field.
3. To explore and understand different biomedical instruments used in practice.
4. Understands different bio signals / potentials

UNIT-I (10 Hrs.)

Biomedical Signals: Origins of Bioelectric Signals, Human body, Heart and Circulatory System, Electrodes, Transducers, ECG, EMG.

UNIT-II (14 Hrs.)

Recording & Monitoring Instruments: Recording Electrodes, Physiological Transducers, Biomedical Recorders, Biomedical Recorders, Heart rate measurement, Temperature measurement, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Biomedical Telemetry.

UNIT-III (12 Hrs.)

Imaging System: Working with X-Rays, CT scanner, NMR, NMR, Ultrasonic System, Ultrasonic System, Ultrasonic System.

UNIT-IV (12 Hrs.)

Therapeutic & Physiotherapy Equipment's: Cardiac Pacemakers, Cardiac defibrillator, SW Diathermy & MW Diathermy.

Patient Safety: Electric Shock Hazards, Test Instruments, Biomedical Equipment's, Biomedical Equipment's.

Recommended Books:

1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation by', Tata McGraw Hill.
2. Leslie Cromwell, 'Biomedical Instrumentation and Measurements', PHI.
3. T.K. Attuwood, 'Introduction to bioinformatics', Pearson Education.
4. Joseph J. Carr & John M Brown, 'Introduction to Biomedical Equipment Technology', Pearson Education.

MICRO-ELECTRONICS

Subject Code: BECE1-564 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
This course introduces general biological concepts:
1. It helps students to understand importance of Microelectronics.
2. To understand IC fabrication, crystal growth, epitaxy, oxidation, photolithography and etching.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Review different IC's and its fabrication steps.
2. Understand need for crystal growth and epitaxial techniques.
3. Different silicon oxidation processes.
4. Steps behind photolithography and etching technique.

UNIT-I (12 Hrs.)

Introduction: Advantages of IC's, General classification of IC's (Linear/Digital IC's, Monolithic/ Hybrid IC's), Basic IC fabrication steps.

UNIT-II (12 Hrs.)

Crystal Growth and Epitaxy: Starting material for formation of crystal, Horizontal Bridgeman Method, Czochralski growth, Distribution of dopants, Zone refining, Silicon Float Zone process, Si-Wafer preparation, Epitaxial growth, Techniques used for epitaxial, growth (LPE, VPE, MBE).

UNIT-III (12 Hrs.)

Silicon Oxidation: Thermal oxidation process (Kinetics of growth, Thin oxide growth), Effect of impurities on the oxidation rate, Preoxidation Cleaning, Various oxidation techniques, Masking properties of SiO2.

Photolithography and Etching: Pattern generation/Mask making, Contact and Proximity printing, Photoresist, Photolithography Process (Lift off technology, Fine line photolithography), Wet/Dry etching, Reactive Plasma etching techniques and applications

UNIT-IV (12 Hrs.)

Diffusion and Ion Implantation: Basic diffusion process (Diffusion equation, Diffusion profiles), Extrinsic diffusion, Lateral Diffusion, Ion Implantation Process (Ion distribution, Ion Stopping), Implant Damage and Annealing process (Furnace and RTA).

IC Packaging: Isolation Techniques, Testing of the Chip, Wire Bonding techniques, Flip Chip technique, Various Packaging methods and Materials.

Fabrication of Monolithic Components: Fabrication of Diodes, Resistors, capacitors and inductors, Fabrication of BJT and FET, Fabrication of MOS Devices, CMOS fabrication techniques (n-well and p-well process sequences), Introduction to MEMS.

Recommended Books:
1. Gray S. May and Simon M. Sze, 'Fundamental of Semiconductor Fabrication', John Wiley & Sons.
2. Sze, 'VLSI Technology', McGraw Hill Publisher.
3. Jacob and Millman, 'Microelectronics', McGraw Hill Publisher.

MICROWAVE AND ANTENNA THEORY

Subject Code: BECE1-623 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. To inculcate understanding of the basics required for circuit representation of RF networks.
2. To deal with the issues in waveguides and different modes.
3. To provide knowledge on the different antenna parameters and antenna types.
4. To explore designing of antenna arrays.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Explain the active & passive microwave devices & components used in Microwave communication systems.
2. Analyze the various Microwave tubes.
3. To understand various antenna parameters and different kinds of antennas.
4. To analyze different antenna arrays.

Unit-I (10 Hrs.)

Waveguides: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, characteristic impedance, introduction to circular waveguides and planar transmission lines.

Unit-II (14 Hrs.)

Microwave Components: Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators, mixers & detectors, matched Load, phase shifter, wave meter, Ferrite devices: Isolators, circulators.

Microwave Tubes: Limitation of conventional tubes: Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO, crossed field amplifiers.

Unit-III (14 Hrs.)

Antenna Parameters: Radiation pattern, Gain, Directive gain, Directivity, effective aperture, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle.

Broadband Antennas: Helical antennas, frequency independent antennas, Log - periodic antennas. Aperture antennas, smart antennas. Long Wire antenna, folded dipole antenna, Yagi-Uda antenna, Slot antenna, Micro Strip or Patch antennas, Antenna measurements.

Unit-IV (10 Hrs.)

Antenna Arrays: Various forms of antenna arrays, arrays of point sources, non-isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing, Dolph-Tchebysceff arrays, continuous arrays, rectangular arrays.

Recommended Books:
1. Samuel Liao, 'Microwave Devices and Circuits', PHI.
2. M. Kulkarni, Umesh, 'Microwave Devices & Radar Engg.'.
3. A.K. Maini, 'Microwaves and Radar', Khanna Publishers.
4. Balanis A. Constantine, 'Antenna Theory, Analysis and Design', Wiley, New York.

MICROCONTROLLER AND EMBEDDED SYSTEM

Subject Code: BECE1-624 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
The students should be made to:
1. Study the Architecture of 8051 microcontrollers.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.

Course Outcomes:
At the end of the course, the students should be able to:
1. Design and implement 8051 microcontroller based systems.
2. Serial communication 0f 8051.
3. Interfacing with 8051.

Unit-I (12 Hrs.)

Introduction: 8051 microcontroller, comparison of microcontroller and microprocessors, Embedded Systems, 8051 Microcontroller: Architecture and Pin Diagram, Program Counter and RAM Spaces, Data types and Directives, Flag Bits and PSW Register, Register Banks and Stack, interrupt.

Unit-II (12 Hrs.)

Programming: Basic assembly language programming concepts Addressing Modes, Arithmetic, Logical instructions and Programming, I/O Port Programming, BCD and ASCII application programs, Single-bit instruction programming, Timers and Counter Programming, Jump and loop Instructions, Introduction of 8051 Programming in C.

Unit-III (12 Hrs.)

Serial communication of 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, serial communication programming, Programming of timer interrupts, Programming of External hardware interrupts, Interrupt priority.

Unit-IV (12 Hrs.)

Interfacing with 8051: LCD and Keyboard Interfacing, interfacing with external memory and 8051 data memory space, interfacing with 8255, Sensors Interfacing and Signal Conditioning, interfacing with Stepper Motor and Servo motors, DS12887 RTC Interfacing and its programming.

Recommended Books:
1. Mazidi Muhammad Ali, 'The 8051 Microcontroller and Embedded Systems', Pearson Publications.
2. Manish K Patel, 'The 8051 Microcontroller Based Embedded Systems', McGraw Hill Publications.
3. Scot MacKenzie, Raphael C.W Phan, 'The 8051 Microcontroller', Pearson Publications.
4. Kenneth J. Ayala, 'The 8051 Microcontroller', Thomson Publishers.

LINEAR CONTROL SYSTEM

Subject Code: BECE1-625 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the elements of control system and their modeling using various Techniques.
2. To introduce methods for analyzing the time response, the frequency response and the stability of systems
3. To introduce the state variable analysis method.
4. Design the compensation technique that can be used to stabilize control systems.

Course Outcomes:

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

1. Perform time domain and frequency domain analysis of control systems required for stability analysis.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Express and solve system equations in state-variable form (state variable models).
4. Determine the (absolute) stability of a closed-loop control system
5. Apply root-locus technique to analyze and design control systems.

Unit-I (8 Hrs.)

Basic Concepts: Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems.

Unit-II (12 Hrs.)

Mathematical Models of Control System: Linear and non-linear systems, Transfer function, Mathematical modeling of electrical, mechanical and thermal systems, Analogies, Block diagrams and signal flow graphs.

Control Components: DC servomotor, AC servomotor, Potentiometers, Synchronous, Stepper-motor.

Unit-III (14 Hrs.)

Time and Frequency Domain Analysis: Transient and frequency response of first and second order systems, Correlation ship between time and frequency domain specifications, Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

Stability Analysis: Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

Unit-IV (14 Hrs.)

State Variable Analysis: Introduction, Concept of State, State variables & State models, State Space representation of linear continuous time systems. State models for linear continuous – time systems, State variables and linear discrete time systems, Solution of state equations, Concept of Controllability & Observability.

Recommended Books:

1. K. Ogata, 'Discrete time Control Systems', Prentice Hall International.
2. Nagrath and Gopal, 'Control System Engineering', New Age International.
3. Warwick, Kevin, 'An Introduction to Control Systems', World Scientific Publishing Co. Pvt. Ltd.

4. W.S. Levine, 'Control System Fundamentals', CRC Press.
5. Williams, Ivan J. Distefano, Joseph J. Stubberud, Allen R., 'Feedback and Control Systems', Schaum's Outlines.

MICROWAVE ENGINEERING LAB.

Subject Code: BECE1-626 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
The student should be made to:
1. Know about the behavior of microwave components.
2. Practice microwave measurement procedures.

Course Outcomes:
At the end of the course, the student should be able to:
1. Test& analyze various microwave components.
2. Analyze the radiation pattern of antenna.

EXPERIMENTS

1. Study of wave guide components.
2. To study the characteristics of reflex Klystron and determine its tuning range.
3. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space waves length and guide wavelength.
4. To measure VSWR of unknown load and determine its impedance using a smith chart.
5. To match impedance for maximum power transfer using slide screw tuner.
6. To measure VSWR, insertion losses and attenuation of a fixed and variable attenuator.
7. To measure coupling and directivity of direction couplers.
8. To measure insertion loss, isolation of a three port circulator.
9. To measure the Q of a resonant cavity.
10. To study the V-I characteristics of GUNN diode.
11. To study the radiation pattern of Horn Antenna.

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

MICROCONTROLLER LAB.

Subject Code: BECE1-627 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
The student should be made to:
1. Introduce microcontroller concepts and features.
2. Introduce the practical concepts to control speed of DC and stepper motor.

Course Outcomes:
At the end of the course, the student should be able to:
1. Write programs for 8051 micro controller kit.
2. Understand programs for speed control of DC motor.
3. Understanding to control the speed of stepper motor.

EXPERIMENTS

1. Study of 8051 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
5. Write a program to show the use of INT0 and INT1.
6. Write a program of Flashing LED connected to port 1 of the Micro Controller
7. Write a program to generate a Ramp waveform using DAC with micro controller.
8. Write a program to interface the ADC.
9. Write a program to control a stepper motor in direction, speed and number of steps.
10. Write a program to control the speed of DC motor.
11. Interfacing of high power devices to Micro-controller port-lines, LED, relays and LCD display

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

NANO SCIENCE AND NANO TECHNOLOGY

Subject Code: BECE1-665 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To create awareness about nanotechnology issues.
2. To impart knowledge about carbon age and nano tubes.
3. To create awareness about Quantum computing**.**
4. To study the various characterization techniques in nano-electronics

Course Outcomes:

Students shall be able to:

1. Understand the fundamentals and basics of nanotechnology.
2. Understand significance and potential opportunities to create better materials and products.
3. Describe different nano-scale devices.

UNIT I (12 Hrs.)

Basics and Scale of Nanotechnology: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress.

UNIT II (12 Hrs.)

The Carbon Age and Nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical vapor deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics: Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs.)

Nano-scale Devices: Introduction: Quantum Electron Devices: High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing: Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books:

1. C.P. Polle and F.J. Owens, 'Introduction to Nanotechnology' Willey India Pvt. Ltd.
2. Daniel Minoli, 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd.
3. Manasi Karkare, 'Nano Technology: Fundamentals and Applications', I.K. International Pvt. Ltd.
4. Lynn E. Foster, 'Nano Technology', Pearson India.

ADVANCED MICROPROCESSOR

Subject Code: BECE1-666 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

Microprocessors and Microcontrollers are widely used in modern society with applications ranging from automatic gadgets to medical applications. The purpose of this course is to:

1. Introduce students with the advanced technology in embedded systems.
2. The objective is to make students understand architecture and programming of embedded processors.
3. Students will able to interface various circuits with advanced processors.

Course Outcomes:

1. Students will have ability to deal with 16 bit microprocessors.
2. They will be familiar with latest microprocessor.
3. Students will have skills to interface any peripheral devices with different microprocessors.

Unit I (12 Hrs.)

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

Unit II (12 Hrs.)

8086 Assembly Language Programming: 8086 flags, JUMP operations, STRING operations, CALL & RET operations, STACK operations, Instruction set of an 8086, 8086 hardware configuration, addressing memory & ports, 8086 Interrupts and interrupt responses, Interrupt system based on 8259 A**.**

Unit III (12 Hrs.)

Interfacing with 8086 Microprocessor: Concept of programmable devices, architecture and programming of programmable I/O port timer, programmable interval timer, programmable peripheral interface, its interfacing with 8086 microprocessor.

Unit IV (12 Hrs.)

Introduction to Advanced Microprocessors: Architectures of 80186-286-386-486, Pentium Processors, Dual core processors, Core to duo, I5 and I-7 Processors.

Recommended Books:

1. Douglas V. Hall, 'Microprocessor & Interfacing: Programming & Hardware', Tata McGraw Hill.
2. M.A. Mazidi, J.G. Mazidi, R.D. McKinlay, 'The 8051 Micro Controllers & Embedded Systems', Indian Reprint, Pearson Education.
3. Kenneth J, Ayala, '8051 Microcontroller: Architecture, Programming and Application', Delmar Learning.
4. Brey, 'Intel Micropocessors, The 8056/8055, 80186/80188, 8028, /80386, 80486, Pentium & Pentium Pro, Pentium II, III, IV: Architecture, Programming and Interfacing', PHI.
5. Myke Predko, 'Programming and Customizing the ARM7 Microcontroller', McGraw Hill.
6. John Morton, 'The PIC Microcontroller: Your Personal Introductory Course', Newnes an Imprint of Butterworth-Heinemann Ltd.

IMAGE AND SPEECH PROCESSING

Subject Code: BECE1-667 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

The student should be made to:

1. Learn digital image fundamentals.
2. Be familiar with image compression and segmentation techniques.
3. To introduce speech production and related parameters of speech.
4. To show the computation and use of techniques used in image compression and enhancement.
5. To understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Discuss digital image and speech fundamentals.
2. Apply image enhancement and restoration techniques.
3. Model speech production system and describe the fundamentals of speech.
4. Extract and compare different speech parameters.

Unit-I (12 Hrs.)

Introduction to Image Processing: Historical background, visual perception, image formation, Elements of Storage, sampling & Quantization, Relationships between pixels-neighbors of pixel, connectivity labelling of connected components, Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging, application of image Processing.

Unit-II (12 Hrs.)

Image Enhancement: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo-morphic felling, generation of spatial marks, Colour image processing.

Unit-III (12 Hrs.)

Image Compression: Redundancy models, error free compression, Lossy compression, Image compression standards.

Image Segmentation: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation, use of motion in segmentation.

Unit-IV (12 Hrs.)

Speech Processing: Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis Speech Recognition-speech in the computer-human interface.

Recommended Books:

1. Rafact Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Society.
2. Keenneth R. Castleman, 'Digital Image Processing', Pearson Education Society.
3. A.K. Jain, 'Fundamental of Digital Image Processing', PHI.
4. Iain Murray, 'Speech and Audio Processing for multimedia PC's', Pearson Education Society.

OPTICAL FIBER COMMUNICATION

Subject Code: BECE1-668 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. To Facilitate the knowledge about optical fiber sources and transmission techniques.
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
3. To explore the trends of optical fiber measurement systems.

Course Outcomes:

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

1. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
2. Explain the various optical sources and optical detectors and their use in the optical communication system.
3. Analyze the digital transmission and its associated parameters on system performance

Unit-I (12 Hrs.)

Introduction to Optical Communication Systems: Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Optical Fibers: Optical fibers structures and their types, fiber characteristics: attenuation, scattering, absorption, fiber bend loss, dispersion, fiber couplers and connectors

Unit-II (12 Hrs.)

Led Light Source: Light emitting diode: recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

Unit-III (12 Hrs.)

Laser Light Source: Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

Unit-IV (12 Hrs.)

Avalanche and Pin Photodetectors: Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

Recommended Books:

1. John M Senior, 'Optical Fiber Communications', PHI.
2. Gerd Keiser, 'Optical Fiber Communications', TMH

OPERATION RESEARCH

Subject Code: BECE1-669 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To Facilitate the knowledge about decision making systems.
2. To Enrich the idea of different models.

Course Outcomes:

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

1. Identify and develop role of operations in decision making system.
2. Understand the deterministic models.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the waiting line model and project line.
5. Understanding to the decision-making processes.

Unit-I (12 Hrs.)

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on operation research model building –Types & methods.

Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, problems.

Unit-II (12 Hrs.)

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, stepping stone method, MODI methods, degeneracy, assignment, travelling salesman, problems.

Advanced Topic of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

Unit-III (12 Hrs.)

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources levelling in project, problems.

Unit-IV (12 Hrs.)

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.

Decision Theory: Decision process, SIMON model, types of decision making environment - certainty, risk, uncertainty, decision making with utilities, problems.

Recommended Books:

1. TAHA, 'Operation Research', PHI, New Delhi.
2. Ackoff, Churchaman, Arnoff, 'Principle of Operations Research', Oxford IBH, Delhi.
3. Vohra, 'Quantitative Techniques', TMH.
4. H.M. Wagher, 'Principles of operation Research (with Applications to Managerial Decisions), Prentice Hall of India.
5. Philips, Revindran, Solgeberg, 'Operation Research', Wiley ISE.

WIRELESS COMMUNICATION SYSTEMS

Subject Code: BECE1-728 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

The student should be made to:

1. Know the characteristic of wireless channel.
2. Learn the various cellular architectures.
3. Understand the concepts behind various digital signaling schemes for fading channels.
4. Be familiar the various multipath mitigation techniques.
5. Understand the various multiple antenna systems.

Course Outcomes:

At the end of the course, the student should be able to:

1. Characterize wireless channels.
2. Design and implement various signaling schemes for fading channels.
3. Compare multipath mitigation techniques and analyze their performance.
4. Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance.

Unit-I (12 Hrs.)

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit-II (12 Hrs.)

Introduction To Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit-III (12 Hrs.)

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signalling, ISDN (Integrated Services Digital Networks), advanced intelligent networks.

Unit-IV (12 Hrs.)

Intelligent Cell Concept and Application: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

Recommended Books:

1. Theodore S. Rappaport, 'Wireless Communications', Pearson.
2. W.C.Y. Lee, 'Mobile Cellular Telecommunication', McGraw Hill.
3. Jochen Schiller, 'Mobile Communications', Pearson.

DIGITAL SIGNAL PROCESSING

Subject Code: BECE1-729 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To learn discrete Fourier transform and its properties.
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals.
3. To understand Finite word length effects.
4. To study the concept of Multirate and adaptive filters.

Course Outcomes:

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

1. Apply DFT for the analysis of digital signals & systems.
2. Design IIR and FIR filters.
3. Characterize finite Word length effect on filters.

Unit-I (12 Hrs.)

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Concept of Frequency in Continuous Time and Discrete Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Applications of Signal Processing.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time systems, Correlation of Discrete Time Signals.

Unit-II (12 Hrs.)

The Z-transform and Its Application to the Analysis of LTI Systems: The z-Transform, Properties of z-Transforms, Inversion of z-Transform, One-sided z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous –Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform for Discrete Time Signals. Frequency Domain Characteristics of Linear Time-Invariant Systems, Linear Time-Invariant Systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

Unit-III (12 Hrs.)

The Discrete Fourier Transform its Properties and Applications: Frequency Domain Sampling: The discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods based on the DFT. Frequency Analysis of Signals Using the DFT.

Efficient computation of DFT: Fast Fourier Transforms: Efficient Computation of DFT: FFT Algorithms, Application of FFT Algorithms, A Linear Filtering Approach to Computation of DFT. Quantization Effect in the Computation of DFT.

Unit-IV (12 Hrs.)

Implementation of discrete time systems: Structures for the realization of Discrete Time Systems, Structures for FIR Systems, Structures for IIR Systems, Representation of Numbers, Quantization of Filter Coefficients, Round off Effect in Digital Filters.

Design of Digital Filters: General Considerations like causality etc., Design of FIR Filters, Design of IIR Filters from Analog Filters, Frequency Transformations, Design of Digital Filters Based on Linear Squares Method.

Sampling and Reconstruction of Signals: Sampling of Bandpass Signals, Analog-to-Digital Conversion, Digital-to-Analog Conversion.

Recommended Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Applications', Pearson Prentice Hall.
2. S.K. Mitra, 'Digital Signal Processing: A Computer Based Approach', TMH.
3. A.V. Oppenheim, R.W. Schafer and J.R. Buck, 'Discrete-time Signal Processing', Prentice Hall.
4. B. Widrow and S.D. Stearns, 'Adaptive Signal Processing', Prentice Hall.

DIGITAL SIGNAL PROCESSING LAB

Subject Code: BECE1-730 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. To implement Linear and Circular Convolution.
2. To implement FIR and IIR filters.

3. To study the architecture of DSP processor.
4. To demonstrate Finite word length effect.

Course Outcomes:

Students will be able to:

1. Carry out simulation of DSP systems.
2. Demonstrate their abilities towards DSP processor based implementation of DSP systems.
3. Analyze Finite word length effect on DSP systems.
4. Demonstrate the applications of FFT to DSP.

EXERCISES

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. Write a program in MATLAB to generate standard sequences.
3. Write a program in MATLAB to compute power density spectrum of a sequence.
4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
5. Write a program in MATLAB to verify linear convolution.
6. Write a program in MATLAB to verify the circular convolution.
7. To develop program for finding magnitude and phase response of LTI system Described by system function H(z).
8. To develop program for finding response of the LTI system described by the difference equation.
9. To develop program for computing inverse Z-transform.
10. To develop program for computing DFT and IDFT.
11. To develop program for conversion of direct form realization to cascade form realization.
12. To develop program for cascade realization of IIR and FIR filters.
13. To develop program for designing FIR filter.
14. To develop program for designing IIR filter.
15. To write a MATLAB program for noise reduction using correlation and autocorrelation methods.
16. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response
    from the given transfer function of a discrete-time causal system.
17. Write a program in MATLAB to find frequency response of different types of analog filters.
18. Write a program in MATLAB to design FIR filter (LP/HP) through Window technique.
    a. Using rectangular window.
    b. Using triangular window.

Note: At least 12 experiments are required to be performed.

MINOR PROJECT

Subject Code: BECE1-730 **L T P C**
0 0 8 4

The students are required to undergo Minor Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner

will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

COGNITIVE RADIO

Subject Code: BECE1-770 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The student should be made to:
1. Know the basics of the software defined radios.
2. Learn the design of the wireless networks based on the cognitive radios.
3. Understand the concepts of wireless networks and next generation networks.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Describe the basics of the software defined radios.
2. Design the wireless networks based on the cognitive radios.
3. Explain the concepts behind the wireless networks and next generation networks.

Unit-I (12 Hrs.)

Spectrum Scarcity: history and background leading to cognitive radios, Software define radios (SDRs), basic architecture of SDR, power control in cognitive transceivers, Dynamic Spectrum Access, new opportunities, spectrum management.
Cognitive Radios: Scarcity problems, network protocols, standardization, security issues.

Unit-II (12 Hrs.)

Spectrum Sensing: ideal spectrum sensing, Spectrum sensing techniques: Transmission detection (Energy detection, cyclostationary detection, matched filter detection), feature based detection, interference detection, spectrum sensing in fading environment.

Unit-III (12Hrs)

Cooperative Sensing: Importance of cooperative sensing, advantages of spectrum sensing, need of co-operations, centralized cooperative sensing, distributed spectrum sensing. Fusion rules: hard fusion, soft fusion rules.

Unit-IV (12 Hrs.)

Spectrum Management: Spectrum handoff management, spectrum mobility, spectrum sensing in ad-hoc network, spectrum sharing.
Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Recommended Books:
1. Bruce A. Fette, 'Cognitive Radio Technology', Elsevier Publication.
2. Ekram Hossain, Dusit Niyato, Zhu Han, 'Dynamic Spectrum Access and Management in Cognitive Radio Networks', Cambridge University Press.
3. Kwang-Cheng Chen, Ramjee Prasad, 'Cognitive Radio Networks', John Wiley & Sons Ltd.
4. Huseyin Arslan, 'Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems', Springer.
5. Linda Doyle, 'Essentials of Cognitive Radio', Cambridge University Press.

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Subject Code: BECE1-771 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the concept of database systems
2. To prepare the student to be in a position to use and design databases for different applications.

Course Outcomes:

1. Master the basic concepts and appreciate the applications of database systems.
2. Be familiar with a relational model.
3. Design principles for relational query language.

Unit-I (12 Hrs.)

Introduction to Database Systems: File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

Physical Data Organization:

File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

Unit-II (12 Hrs.)

Data Models: Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

The Relational Model:

Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

Unit-III (12 Hrs.)

Relational Query Languages:

SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

Database Design:

Functional Dependencies, reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions.

Unit-IV (12 Hrs.)

Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, 2PL protocol.

Database Protection: Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital Signatures.

Recommended Books:

1. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', Pearson Education.
2. C.J. Date 'An Introduction to Database Systems', Pearson Education.
3. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press.
4. S. K. Singh, 'Database Systems Concepts, Design and Applications', Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', Tata McGraw Hill.
6. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, 'Database System Concepts', Tata McGraw Hill.

COMPUTER ARCHITECTURE AND ORGANIZATION

Subject Code: BECE1-772 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To expose the students to the concept of pipelining.
5. To familiarize the students with hierarchical memory system including cache memories and virtual memory.
6. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design arithmetic and logic unit.
2. Design and analysis of pipelined control units
3. Evaluate performance of memory systems.
4. Understand parallel processing architectures**.**

Unit-1 (12 Hrs.)

Basic Principles: Boolean algebra and Logic gates, Combinational logic blocks (Adders, Multiplexers, Encoders, de-coder), Sequential logic blocks (Latches, Flip-Flops, Registers, Counters)

General System Architecture: Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD): Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language: structured organization: CPU, caches, main memory, secondary memory units & I/O: Performance metrics: MIPS, MFLOPS.

Unit-II (12 Hrs.)

Instruction Set Architecture: Instruction set based classification of processors (RISC, CISC, and their comparison): addressing modes: register, immediate, direct, indirect, indexed:

Operations in the instruction set: Arithmetic and Logical, Data Transfer, Control Flow: Instruction set formats (fixed, variable, hybrid): Language of the machine: 8086: simulation using MSAM.

Unit-III (12 Hrs.)

Basic non pipelined CPU Architecture: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage): microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining.

Memory Hierarchy & I/O Techniques: The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit): Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types): Cache memory (Associative & direct mapped cache organizations.

Unit-IV (12 Hrs.)

Introduction to Parallelism: Goals of parallelism (Exploitation of concurrency, throughput enhancement): Amdahl's law: Instruction level parallelism (pipelining, super scaling –basic features): Processor level parallelism (Multiprocessor systems overview).

Computer Organization [8086]: Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts: Memory Hierarchy.

Recommended Books:

1. David A. Patterson and John L. Hennessy, 'Computer Organization and Design', Morgan, Kauffmann, Elsevier Publisher.
2. John P. Hayes, 'Computer Architecture and Organization', TMH.
3. William Stallings, 'Operating Systems Internals and Design Principles', Prentice Hall Upper Saddle River, New Jersey.

SOFT COMPUTING

Subject Code: BECE1-773 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

The students should be:

1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn genetic programming.

Course Outcomes:

Upon completion of the course, the student should be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic.
4. Apply genetic programming.

Unit-I (12 Hrs.)

Neural Networks: Fundamentals of Neural Networks – History- Architectures- Learning methods- XOR Problem-Delta rule- Derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM- energy function- problems-applications of associative memories- ART1- ART2- applications of adaptive networks.

UNIT-II (12 Hrs.)

Fuzzy Logic: Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems- Crisp logic – predicate logic – fuzzy logic- fuzzy based systems - Defuzzification methods – applications.

Unit-III (12 Hrs.)

Genetic Algorithms: Fundamentals of GA – creation of offspring – encoding – fitness function reproduction – crossover- insertion& deletion- mutation- bitwise operators – applications.

UNIT-IV (12 Hrs.)

Programming Using Mat Lab: Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directed search toolbox.

Recommended Books:

1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley Publications.
2. Yagna Narayanan, 'Artificial Neural Networks', PHI.
3. Bart Kosko, 'Neural Networks & Fuzzy Logic', Prentice Hall
4. Simon Haykin, 'Neural Networks', Prentice Hall.

VLSI DESIGN

Subject Code: BECE1-833 **L T P C** **3 1 0 4** **Duration: 48 Hrs.**

Course Objectives:

1. In this course, the MOS circuit realization of the various building blocks that is common to any digital VLSI circuit is studied.
2. Architectural choices and performance trade-offs involved in designing and realizing the circuits in CMOS technology are discussed.

Course Outcomes:

Upon completion of the course, students should:

1. Explain the basic CMOS circuits and the CMOS process technology.
2. Discuss the techniques of chip design using programmable devices.
3. Model the digital system using Hardware Description Language.

Unit-I (12 Hrs.)

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture declaration Introduction to behavioural, dataflow and structural models.

VHDL Statements: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

Unit-II (12 Hrs.)

Applications of VHDL: Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

Unit-III (12 Hrs.)

Review of MOS Devices: MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.

Basic Electrical Properties and Circuit Concepts: The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.

Unit-IV (12 Hrs.)

Circuit Characterization and Performance Estimation: Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Recommended Books:

1. Bhasker, 'A VHDL Primmer', Prentice Hall.
2. Weste and Eshrighian, 'Principle of CMOS VLSI Design', Pearson Education.
3. D.A. Pucknell and K. Eshraghian, 'Basic VLSI Design', Prentice Hall India, New Delhi.
4. Brown and Vranesic, 'Fundamentals of Digital Logic with VHDL Design', TMH.
5. S.M. Kang, Y. Lebiebici, 'CMOS Digital Integrated Circuits Analysis & Design', TMH.

VLSI DESIGN LAB.

Subject Code: BECE1-834 **L T P C** **Duration: 24 Hrs**

0 0 2 1

Course Objectives:

1. To learn Hardware Descriptive Language(Verilog/VHDL)
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain
3. To familiarize fusing of logical modules on FPGAs
4. To provide hands on design experience with professional design (EDA) platforms.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write HDL code for basic as well as advanced digital integrated circuits.
2. Import the logic modules into FPGA Boards.
3. Synthesize Place and Route the digital IPs.
4. Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

EXPERIMENTS

1. Design of basic Gates: AND, OR, NOT.
2. Design of universal gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Substractor, Full Substractor
6. Design of 3:8 Decoder

7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Design of 4 Bit Binary to BCD Converter using sequential statement
10. Design an 8 Bit parity generator (with for loop and Generic statements)
11. Design of 2,s Complementary for 8-bit Binary number using Generate statements

SEQUENTIAL DESIGN EXPERIMENTS

1. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs
2. Design of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
3. Design of Synchronous 8-bit Johnson Counter.
4. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3- state
5. output (IC 74299)
6. Design of 4 Bit Binary to BCD Converter using sequential statement.
7. Design counters (MOD 3, MOD 5, MOD 8, MOD 16)
8. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
9. Design 3-line to 8-line decoder with address latch

Note: At least 12 experiments are required to be performed.

MAJOR PROJECT

Subject Code: BECE1-874 **L T P C**
0 0 12 6

The students are required to undergo Major Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

CELLULAR AND MOBILE COMMUNICATION

Subject Code: BECE1-874 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the radio wave propagation and interference in mobile communications.
2. To understand the basic knowledge about the generations of mobile communication.
3. To study different architectures of mobile communication and its related parameters.
4. To impart the knowledge about applications of mobile communication.

Course Outcomes:

Student shall be able to:

1. Understand the cellular systems
2. Analyse the concept of switching systems and base station subsystem.

Unit–I (12 Hrs.)

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface – specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features. 3G Systems: UMTS & CDMA 2000 standards and specifications.

Unit –II (12 Hrs.)

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co–channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co–channel interference, real time co–channel interference, co–channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co–channel interference – different types.

Unit –III (12 Hrs.)

Cell Coverage for Signal &Traffic: General introduction, obtaining the mobile point to point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Unit –IV (12 Hrs.)

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non–fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls: hand off, types of handoff and their characteristics, dropped call rates &their evaluation.

Optional Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Books:

1. Kamilo Feher, 'Wireless and Digital Communications', PHI.
2. T.S. Rappaport, 'Wireless Communication, Principles & Practice'.
3. William, C.Y. Lee, 'Mobile Cellular Telecommunications', McGraw Hill.

WIRELESS SENSORS NETWORKS

Subject Code: BECE1-875 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. This course introduces advances in wireless, sensor networks.
2. Wireless Sensor Networks provide opportunities even outside their usual application domain of environmental monitoring.
3. To track all activities, and check for errors that might occur in the process of handling and distributing goods.

Course Outcomes:

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

1. Understand the existing applications of wireless sensor actuator networks.
2. Understand the elements of distributed computing and network protocol design and will learn to apply these principles in the context of wireless sensor networks.
3. Identify the various hardware, software platforms that exist for sensor networks.

Unit-I (12 Hrs.)

Introduction to Wireless Sensor Networks: Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness Advantages of sensor networks, Sensor network applications.

Unit-II (12 Hrs.)

Topology Control: Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF), GEAR, Connectivity driven, SPAN, ASCENT.

Unit-III (12 Hrs.)

WSN Sensors: Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols &Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address & Name management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing.

Unit IV (12 Hrs.)

WSN Platforms & Tools: Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Recommended Books:

1. Holger Karl & Andreas Willig, 'Protocols & Architectures for Wireless Sensor Networks', John Wiley.
2. Feng Zhao & Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach'.
3. Waltenegus Dargie and Christian Poella Bauer, 'Fundamentals of Wireless Sensor Networks Theory and Practice', John Wiley and Sons.
4. Holger Karl and Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley and Sons.

INFORMATION THEORY AND CODING

Subject Code: BECE1-876 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. To aware the students about the information theory.
2. To provide the basic concepts of channel capacity.
3. To impart knowledge about linear block codes.
4. To study convolution and BCH codes.

Course Outcomes:

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

1. Understand concepts of entropy, mutual information and divergence.
2. Apply and analyze the principles of channel capacity.
3. Use various types of check metrics, linear and cyclic codes.
4. Understand working principle of convolution codes.

Unit-I (12 Hrs.)

Information Theory: Definition of Information, Entropy, Mutual Information, Properties of Mutual Information, Fundamental Inequality, I.T. Inequality, Divergence, Properties of Divergence, Divergence Inequality, Relationship between entropy and mutual information, Chain Rules for entropy, relative entropy and mutual information.

Unit-II (12 Hrs.)

Channel Capacity: Uniform Dispersive Channel, Uniform Focusing Channel, Strongly Symmetric Channel, Binary Symmetric Channel, Binary Erasure Channel. Channel Capacity of the all these channels, Channel Coding Theorem, Shannon-Hartley Theorem.

Data Compression: Kraft inequality, Huffman codes, Shannon-Fano coding, Arithmetic Coding.

UNIT-III (12 Hrs.)

Linear Block Codes: Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, Hamming Code.

Cyclic Codes: Description of Cyclic codes, Generator and parity check matrices of cyclic codes, error detection decoding of cyclic codes.

UNIT-IV (12 Hrs.)

Convolution Codes: Encoding of convolution codes, structural properties of Convolution codes, Distance Properties of convolution codes.

Recommended Books:

1. Arijit Saha, 'Information Theory, Coding & Cryptography', Pearson Education.
2. Ranjan Bose, 'Information Theory, Coding and Cryptography', Tata McGraw Hill.
3. Thomas M. Cover, Joy A. Thomas, 'Elements of Information Theory', Wiley India Pvt.
4. J. Mary Jones, 'Information and Coding Theory', Springer.

OPERATING SYSTEMS

Subject Code: BECE1-877 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. General understanding of structure of modern computers
2. Purpose, structure and functions of operating systems
3. 3.Illustration of key Operating system aspects by example

Course Outcomes:

By the end of the course you should be able to:

1. Describe the general architecture of computers
2. Describe, contrast and compare differing structures for operating systems
3. Understand and analyze theory and implementation of: processes,
4. Resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

Unit-I (12 Hrs.)

Operating System Concepts an Introduction: What is an OS, Need of OS, Different views of an OS, Evolution of OS, Batch Processing, Multiprocessing, Multiprogramming, Time Sharing, Real Time Systems, Network OS, Parallel Processing, Distributed Processing.

Operating System Structures: OS services, System Calls, System Structures, Layered Architecture of an OS.

Introduction to process: Concept of process, Process states and their transitions, PCB, Process Scheduling, Operations on process: Process creation and termination, Threads: User level and kernel level threads.

Unit-II (12 Hrs.)

CPU Scheduling: Introduction, CPU scheduler, Scheduling criteria, Scheduling algorithms: FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

Process Synchronization: Co-operating process, Concurrency, Semaphores.

Deadlocks: Introduction, Deadlock characteristics, Recognition methods, Dealing with deadlocks, Deadlock prevention, avoidance, detection and deadlock recovery.

Unit-III (12 Hrs.)

Memory Management Basics: Introduction, Logical vs. physical address space, Program relocation & management techniques, Continuous storage allocation, Fixed partition contiguous storage allocation, Variable partition CSA, Non-contiguous storage allocation, paging, segmentation.

Virtual Memory: Introduction, Swapping, Demand paging, Pure demand paging FIFO, Optimal.

File System Interface & implementation: File concepts, File naming, File attributes, File access methods, Directory structure.

Unit-IV (12 Hrs.)

Device Mgmt & Storage Structure: I/O subsystems, I/O channels, Secondary storage, Disk structure, Disk scheduling, FIFO, Shortest seek time first SSTF scan, C-SCAN, Look &C-look Disk scheduling algo's.

Protection & Security Introduction: Introduction, Goals of protection, Access rights, Access matrix, Security & its goals, Authentication, Passwords, Encryption, Viruses, worms, Dealing with viruses.

Case Study: UNIX &WIN NT.

Recommended Books:

1. Peter Galvin, 'Operating systems Concepts', Addison Wessly.
2. Ekta Walia, 'Operating systems Concepts', Khanna Publisher.

SATELLITE COMMUNICATION

Subject Code: BECE1-878 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. To introduce various aspects in the design of systems for satellite communication.
2. Students will be able to understand link design for satellite communication.
3. To provide the knowledge of various multiple access techniques.

Course Outcomes:

Students will be:

1. Able to learn the dynamics of the satellite.
2. Able to understand the communication satellite design.

3. Able to understand how analog and digital technologies are used for satellite communication networks.
4. Able to learn the design of satellite links.
5. Able to study the design of Earth station and tracking of the satellites.

Unit-I (12 Hrs.)

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & ionosphere effects on link design, complete link design, interference effects on complete link design, earth station parameters.

Unit-II (14 Hrs.)

Satellite Analog & Digital Communication: Baseband analog(voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques: TDMA frame structure, burst structure, frame efficiency, super frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

Unit-III (10 Hrs.)

Laser & Satellite Communication: Link analysis, optical satellite link Transmitter & Receiver, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fiber CAT system.

Unit-IV (12 Hrs.)

Satellite Applications: Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Books:

1. Timothy Pratt, 'Satellite Communication', John Wiley & Sons.
2. D.C. Aggarwal, 'Satellite Communication', Khanna Publishers.