NOTIFICATION

No. 136 /2021 Date : 02/12/2021

Subject :- Implementation of new syllabi of Semester V & VI of B.E. (Electronics & Telecommunication Engg.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum from the session 2021-2022 & onwards.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabus of **V & VI** of B.E. in Electronics & Telecommunication Engineering (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2021-2022 and onwards in phase wise manner as per **Appendix – A** :

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SYLLABUS PRESCRIBED FOR B.E. SEMESTER V & VI (ELECTRONICS & TELECOMMUNICATION ENGG.]

5ETC01: MICROCONTROLLER

Course Pre-Requisite:
3ETC03**:** Digital System Design

Course Objectives:

1. To study fundamentals of microprocessor systems
2. To deal with interfacing of different peripheral devices with Microprocessor
3. To study fundamentals of microcontroller systems with Assembly Language Programming
4. To understand microcontroller C Language Programming concepts.
5. To know the importance of different peripheral devices and their interfacing to microcontrollers
6. To get familiar with RISC Architecture

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Attain the knowledge of Microprocessor 8085
2. Understand the Interfacing of various peripheral devices with Microprocessor 8085
3. Attain the knowledge of Microcontroller 8051
4. Understand assembly language & C Programming for Microcontrollers
5. Understand the Interfacing of various peripheral devices with Microcontroller 8051
6. Gain knowledge of advance Microcontrollers

	Subject: MICROCONTROLLER	L
Unit-1	**Introduction to Microprocessor** 8085: Pin Diagram and Architecture,Addressing Modes, Instruction Set, Stack & Subroutine, Interrupt system, Data transfer schemes	8
Unit-2	**I/O Interfacing of 8085** Address space partitioning schemes, Architecture and interfacing of: PPI 8255, PIT 8254, USART 8251.	8
Unit-3	**Introduction to Microcontroller 8051** Architecture, Signal description, Memory organization, Interrupt structure, Timers and its modes, Addressing Modes, Instruction set, Assembly Language Programming, Serial communication modes	9
Unit-4	**8051 Programming in C :** Data types, IO programming, Logic operations, Data conversion programs, Accessing code ROM space, Data serialization.	8
Unit-5	**Interfacing and Programming using C with 8051:** LED, LCD display, Keyboard, Stepper Motor, DC motor, Relays, ADC 0808, DAC 0809	8
Unit-6	**Introduction to RISC Processors:** RISC Features, Difference between CISC and RISC, 32 bit ARM7 Philips NXP LPC2148 Microcontroller : Architecture, Registers, Pipeline	7
	Total	**36**

Text Books:

1. Gaonkar R.S: ñMicroprocessor Architecture Programming and Applications with the 8085ò, Penram International Pub.
2. M. A. Mazidi, J. G. Mazidi and R. D. McKinley : ñThe 8051 Microcontroller and Embedded Systems using Assembly and Cò, Pearson Education (2nd Ed.)
3. Furber: ñARM System on Chip Architecureò, 2nd Edition, Person India

References:

1. K. J. Ayala : ñThe 8051 Microcontrollerò, Penram Int. Pubs., 1996
2. Phillips NXP LPC 2148 User Manual.
3. Data Sheet Manual by INTEL

5ETC02: CONTROL SYSTEM

Course Pre-Requisite:

1. (IA1) Engineering Mathematics-I
2. (IB1) Engineering Mathematics-II
3. (4ETC3) Signals and Systems

Course Objectives:

1. To understand the fundamental concepts of Control systems and mathematical modeling of the physical systems.
2. To analyze time response of the LTI system.
3. To analyze LTI system using frequency response.
4. To develop and analyze State Variables of the system.

Course Outcomes:

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

1. Understand mathematical models of electrical, mechanical and electromechanical systems.
2. Determine transfer functions from block diagrams and signal flow graph.
3. Evaluate transient response and steady state response parameters.
4. Analyze stability of the LTI system using Routh criterion and root locus
5. Analyze stability of the LTI system using bode plot and Nyquist criterion
6. Create the state model and Evaluate response of the system using state variable method.

	Subject: CONTROL SYSTEM	L
Unit-1	**Basics of Control system** Types of control systems Classification of control system, Mathematical modeling of Physical Systems, Electrical Analogous Systems, Force -voltage analogy, force- Current analogy.	5
Unit-2	**Control system Representation** Block diagram reduction technique, rules for block diagram reduction. Analysis of multiple input multiple output systems, properties of signal flow graphs, Masonôs gain formula basic control actions.	6
Unit-3	**Time Response Analysis:** Standard test signals, Time response of first order and second order system, impulse response function, Transient domain specifications, Steady state analysis: steady state error and error constants, dynamic error coefficients	6
Unit-4	**Stability of Control System:** Concept of stability, necessary conditions for stability, Routh stability criterion. Root locus Techniques: Introduction, Construction of root locus, construction rules, Stability analysis of systems using root locus, Effect of addition of open loop zeros & poles.	7
Unit-5	**Frequency- Domain analysis:** Introduction, correlation between time and frequency response, Bode plot: general procedure for construction, Gain margin and phase margin, Stability analysis of systems using Bode plots. Polar plots, Nyquist stability criterion.	6
Unit-6	**State Variable Analysis:** Space model representation of LTI systems using physical, phase and canonical variables, Relationship between state variable model and transfer function, state transition matrix and its computation, Solution of state equations. Controllability and Observability.	6
	Total	**36**

Text Books:

1. Nagrath I. J. and M. Gopal, ñControl Systems Engineeringò, 5th Ed. New Age International.
2. K. Ogata: Modern Control Engineering, Fourth Edition (PHI)

References:

1. Richard C. Dorf and Robert H. Bishop, ñModern Control Systemsò, 11th Ed., Pearson Education.
2. M. Gopal, ñControl System ï Principles and Designò, Tata McGraw Hill, 4th Edition, 2012.
3. Norman S. Nise, ñControl System Engineeringò, 5th Edition, Wiley.
4. Bhattarcharya: Control System Engineering, 2nd Edition (Pearson Education).
5. Benjamin C. Kuo , Automatic Control System ñJOHN WILEY & SONS, INC. 9th Edition.
6.

5ETC03: DIGITAL SIGNAL PROCESSING

Course Pre-Requisite:

1. 3ETC01 Engineering Mathematics-III
2. 4ETC04 Signals and Systems

Course Objectives:

1. Learndiscretesignalandsystemfundamentals.
2. Learn the discrete-time signals in the frequency domain, using Z-transform and DFT.
3. UnderstandtheimplementationoftheDFTintermsofthe FFT
4. LearnthebasicformsanddesignofFIRandIIR filters.
5. Learn the application filter bank in multirate DSP.
6. Become aware of some applications of digital signal processing.

Course Outcomes:

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

1. Manipulatethediscretetimesignalsandidentifythetypesystem.
2. Compute the Z-transform of a sequence, identify its region of convergence and compute the inverse Z-transform.
3. Evaluate the Fourier transform of a signal.
4. DesignFIRandIIRfilters.
5. Understand the concepts of Multirate Digital Signal Processing and need of Filter banks.
6. Understand the application of Digital Signal Processing

	Subject: DIGITAL SIGNAL PROCESSING	L
Unit-1	**Introduction to Discrete Time Signals[DTS]:** Discrete Time Signal, representations of DTS, Basic Signal Operations, Linear Convolution by using Analytical and Graphical Method.	6
Unit-2	**Z-Transform:** Definition and Properties of Z-Transform, Concept of Region of Convergence [ROC], Inverse Z-transform using long division method, PFE method and residue method.	6
Unit-3	**Discrete and Fast Fourier Transform:** Definition and Properties of DFT, IDFT. Circular convolution of sequences using DFT and IDFT. Fast Fourier Transforms (FFT), Radix-2 decimation in time and decimation in frequency FFT. [Numerical based on DIT-FFT & DIF-FFT]	6
Unit-4	**Finite Impulse Response (FIR) filters:** Design techniques for FIR filter by windowing method: Rectangular window. Realization of basic structure FIR system: Direct form and Cascade.	5
Unit-5	**Infinite Impulse Response (IIR) filters:** IIR Filter Design by Mapping of S-plane to Z-plane: impulse invariance method, bilinear transformation method. Realization of basic structure IIR system: Direct form-I, Direct Form-II, Cascade & Parallel.	6
Unit-6	**Multirate Digital Signal Processing:** Sampling, Sampling rate conversion, multi-level filter bank. Overview and architecture of DSP processor TMS320C54XX.Applications of DSP (Only Block Diagram): Speech Signal, RADAR & SONAR.	7
	Total	**36**

Text Books:

1. Nagoorkani,ñDigital Signal Processingò,Tata McGraw-Hill Education, Second Edition.
2. S.Salivahanan, A.Vallavaraj,ñDigitalSignalProcessingò,TataMcGraw-HillEducation,2001.

References:

1. Oppenheim&Schafer,ñDiscretetimeProcessingò,PHI.
2. Proakis&ManolakisD.G.,ñDigital Signal Processingò,PHI.
3. MitraS.K.,ñDigital Signal Processingò, TMH.
4. Roman Kuc,ñDigital Signal Processingò, MGH.
5. IfeacherE.C.,JervisB.W.,ñDigital Signal Processingò,AddisonWesley.
6. P.P.Vaidyanathan,ñDSP and Multirate Systemsò, PHI.

5ETC04 Professional Elective - I (PE-I): (i) POWER ELECTRONICS

Course Pre-Requisite:

1. 1B3Basic Electrical Engineering.
2. 3ETC02 Electronic Devices and Circuits.

Course Objectives:

1. To introduce power electronics devices; SCR, TRIAC, IGBT, MOSFET and to learn their characteristics.
2. To develop the ability to analyze the dynamics in power electronic converters/drives systems.
3. To study AC-DC converters and effect of freewheeling diode.
4. To study AC-AC, DC-AC, DC-DC converters.
5. To build and test circuits using power devices such as SCR
6. To study applications of power converters in DC drives.

Course Outcomes:

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

1. Analyze the characteristics of various power electronics devices .
2. Understand SCR firing circuits, commutation techniques.
3. Analyze and design controlled rectifiers and dual converters
4. Analyze and design DC to DC, AC to AC converters and DC to AC inverters,
5. Design and develop power electronic circuits for various applications.
6. Know various applications of power converters in DC drives.

	Subject: POWER ELECTRONICS	L
Unit-1	SCR -construction, characteristics, two transistor analogy for turning ON-OFF a SCR, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuit using UJT, Protection of SCR (snubber circuit)	6
Unit-2	Triac, Diac-construction, characteristics. power transistor, power MOSFET, IGBT - their construction & characteristics, Introduction to GTO, Classification of circuit for forced commutation.	7
Unit-3	Principle of phase control, single phase half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of freewheeling diode, single phase dual converters.	6
Unit-4	Series inverter, improved series inverter, parallel inverter, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorized bridge inverter.	6
Unit-5	Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, step-up chopper, step up/down chopper and AC chopper.	6
Unit-6	Basic principle of cyclo-converter, single phase to single phase cyclo-converter. speed control of DC series motors speed control of DC shunt motor using phase controlled rectifiers UPS, fan speed regulator	5
	Total	**36**

Text Books:

1. M.D.Singh, K.B. Khanchandani, ñPower Electronicsò, Tata McGraw-Hill.
2. Muhammad H. Rashid, ñPower electronicsò Prentice Hall of India.

References:

1. Ned Mohan, Robbins, ñPower electronicsò, edition III, John Wiley and sons.
2. P.C. Sen., ñModern Power Electronicsò, edition II, Chand& Co.
3. V.R.Moorthi, ñPower Electronicsò, Oxford University Press.
4. Cyril W., Lander,ò Power Electronicsò, edition III, McGraw Hill.
5. G K Dubey, S R Doradla,: Thyristorised Power Controllersò, New Age International
6. Publishers. SCR manual from GE, USA.

5ETC04 Professional Elective - I (PE-I): (ii) FIBER OPTICS COMMUNICATION

Course Pre-Requisite:

1. 3ETC04 Electromagnetic Waves
2. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diode
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
5. To learn the fiber optical network components, variety of networking aspects, operational principles WDM.
6. To learn and understand the applications.

Course Outcomes:

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

1. Understand the principles fiber-optic communication, the components and Losses and dispersion in fiber.
2. Understand the properties of the optical fibers and optical components in sources.
3. Understand operation of lasers, LEDs, and detectors in fiber
4. Analyze system performance of optical communication systems in networks
5. Understand the block diagram of FOC System with Power budgeting parameters.
6. To apply the knowledge of fiber optical components, links, and systems.

	Subject: FIBER OPTICS COMMUNICATION	L
Unit-1	**Optical Fiber Communication System:** Basic optical laws and definitions, Optical fiber modes andconfigurations, N.A. Attenuation: Units, absorption, scattering losses radioactive losses, core and cladding losses.Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index.Material dispersion, wave guide dispersion, intermodal dispersion. [Numerical based on N.A. and mode calculations]	6
Unit-2	**Optical Sources:** Light Emitting Diodes: Structure, Light source materials. Laser Diodes: Structure, threshold conditions, Modulations of laser diodes. Light source linearity, reliability considerations.	6
Unit-3	**Optical Detectors:** Principles of photodiodes, Photo detector noise, Detector response time, Avalanche multiplication noise, Temperature effect on avalanche gain.	6
Unit-4	**Optical switches** Coupled mode analysis of directional couplers, electro-optic-switches. Optical amplifiers - EDFA, Raman amplifier	6
Unit-5	WDM and DWDM systems. Principles of WDM networks. Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solution based communication.	6
Unit-6	Block Diagram of fiber optic communication, selection of optical fiber types for short haul, long haul and high speed data links, optical power and dispersion budget calculations of fiber optic communication link, Repeaters, optical fiber amplifiers, optical fiber transmitter and optical fiber receiver design considerations. [Numerical are not expected]	6
	Total	**36**

Text Book: G. Keiser, ñOptical Fibre Communicationò, McGraw Hill International.

Reference:

1. Seniors J. M., ñOptical Fibre Communication and Applicationsò, Prentice Hall of India Pvt. Ltd., New Delhi

5ETC04 Professional Elective - I (PE-I): (iii) SPEECH AND AUDIO PROCESSING

Course Pre-Requisite:

1. 3ETC01 Engineering Mathematics-III
2. 4ETC04 Signals and Systems
3. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To be able to relate human physiology and anatomy with signal processing paradigms.
2. To acquire the knowledge of speech generation and speech recognition models.
3. To understand methods/techniques used in speech signal estimation & detection.

Course Outcomes:

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

1. Illustrate how the speech production is modeled
2. Summarize the techniques involved in collecting the features from the speech signal in time and frequency domain.
3. Summarize the various speech coding techniques.
4. Understand the process Speech Synthesis.
5. Apply techniques/methods used for speech enhancement.
6. Apply techniques/methods used for speech recognition.

	Subject: SPEECH AND AUDIO PROCESSING	L
Unit-1	**Speech Production and Acoustic Phonetics:** Process of speech production, Articulatory phonetics, Acoustic Phonetics, Acoustic theory of speech production, Co- articulation, Prosody, Digital models of speech signals, Brief applications of speech & audio processing	6
Unit-2	**Speech Analysis:** Time and frequency domain methods for analysis of speech: Methods for extracting energy ,average magnitude, zero crossing rate, silence discrimination using ZCR and energy, short time Fourier analysis, Formant extraction, Pitch extraction, Cepstral analysis.	6
Unit-3	**Coding of Speech Signals:** Introduction, Quantization, Speech redundancies, Time domain waveform coding, Linear predictive coding: Linear Delta Modulation ,Adaptive Delta Modulation, Adaptive Differential Pulse Code Modulation	6
Unit-4	**Speech Synthesis:** Principles of speech synthesis, Articulatory synthesis, Formant synthesis and LPC synthesis.	6
Unit-5	**Speech Enhancement:** Introduction, Nature of interfering sounds, speech enhancement techniques: spectral subtraction and filtering, harmonic filtering, Spectral subtraction, Adaptive noise cancellation	6
Unit-6	**Speech Recognition:** Introduction, Bayeôs rule, Segmental feature extraction, MFCC, DTW, HMM approaches for speech recognition	6
	Total	**36**

Text Books:

1. ñSpeech Communications: Human & Machineò, Douglas O'Shaughnessy, Universities Press.
2. ñDigital Processing of Speech Signalsò, Rabiner and Schafer, Prentice Hall, 1978.

References:

1. ñDiscrete-Time Speech Signal Processing: Principles and Practiceò, Thomas F. Quatieri,Publisher: Prentice Hall.
2. ñSpeech and Audio Signal Processing: Processing and Perception of Speech and Musicò,Nelson Morgan and Ben Gold, John Wiley & Sons.
3. ñSpeech Analysis Synthesis and Perceptionò, J. L. Flanagan, Second edition, Springer-Verlag(1972).
4. ñSpeech and Audio Signal Processingò, Gold & Morgan, 1999, Wiley and Sons.

5ETC05 Open Elective - I (OE-I): (i) SENSORS AND TRANSDUCERS

Course Pre-Requisite:

1. 1B3 Basic Electrical Engineering.
2. 3ETC02 Electronic Devices and Circuits.

Course Objectives:

1. To provide a basic knowledge about Sensors and transducers.
2. To learn about the various sensor and transducer for measurement of physical quantities.

Course Outcomes:

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

1. Understand the basic aspect of transducers and sensors
2. Gain knowledge of statistical characteristic and Errors of system.
3. Realize the fundamental concept about temperature and Velocity measurement
4. Acquire knowledge of measurement of displacement and Humidity.
5. Familiarize the basic information about measurement of Pressure, Flow, Level
6. Aware about the basics of Strain gauge and smart sensors

	Subject: SENSORS AND TRANSDUCERS	L
Unit-1	**Sensor & Transducers:** Definition, Types & selection of sensors, Need of sensor, Difference between Sensors & Transducers, Classification of Transducer, Selection criteria. Introduction to Generalized Instrumentation system with example.	6
Unit-2	**Characteristic, parameters and Errors** Characteristics of instruments ï static characteristics, Statistical Parameters with numericals. Error and its Types: Gross error, Systematic Error, Random Error with remedies.	6
Unit-3	**Temperature Measurement:** Introduction to Thermistor, RTD, Thermocouple and LM 335,Total Radiation Pyrometer **Velocity Measurement:** Velocity measurement system by encoder, Magnetic Pickup and Photo detector (Linear and Angular Measurement)	6
Unit-4	**Measurement of Displacement:** Resistive, Inductive (LVDT), Capacitive Methods **Humidity Measurement:** Resistive, Capacitive, Piezoelectric, and Infrared	6
Unit-5	**Measurement of Pressure:** Primary pressure sensors - elastic elements like bourdon tube and diaphragm Electrical/Secondary Pressure Transducers: Capacitive, piezo-electric and its material, Low Pressure (Vacuum): Pirani gauge. **Measurement of Flow:** Hot wire anemometer **Measurement of Level:** Resistive method, Ultrasonic level detector	6
Unit-6	**Strain Measurement:** Introduction, types of strain gauge, gauge factor calculation, materials for strain gauge, resistance strain gauge bridges, temperature compensationand applications of strain gauges. **Introduction to smart sensors**: Objective, block diagram, advantages and disadvantages.	6
	Total	**36**

Text Books:

1. Sawney A K and Puneet Sawney, ñA Course in mechanical measurements and instrumentation and controlò, 12th edition, DhanpatRai and Co, new delhi,2013.
2. Electronics instrumentation" by H. S. Kalsi [TMH]

References:

1. David A. Bell, Electronic Instrumentation and Measurements, Third Edition, Oxford Higher Education
2. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
3. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
4. Ernest O.Doebelin, Measurement systems Application and Design, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.

5ETC05 Open Elective - I (OE-I): (ii) DATA STRUCTURE

Course Pre-Requisite:

1. 3ETC05 Object Oriented Programming

Course Objectives:

To impart the concepts of data structures and algorithms.

Course Outcomes:

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

1. Able to understand basics and applications of different linear and nonlinear data structures
2. Able to design and implement various data structure algorithms and analyze the efficiency of an algorithm.
3. Able to understand Linked List and implement algorithm.
4. Able to understand the working principle and Implementation of stacks and queues.
5. Able to implement learn Trees, Graph and their applications
6. Able to write an algorithm on different sorting methods and analyze the complexities of algorithms.

	Subject: DATA STRUCTURE	L
Unit-1	**Introduction and Overview** Basic Terminologies: Elementary Data Organizations, Introduction to Linear Array, Types and Representation in Memory, Data Structure Operations, Algorithms: Complexity, Time-Space Tradeoff, Searching Methods:Linear Search and Binary Search Techniques and their Complexity Analysis..	6
Unit-2	**Linked List:** Introduction to Linked List, Representation of Linked List in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from linked list, Header Linked Lists, Circular Linked Lists, Two-Way Lists (Doubly linked list) and Operations.	6
Unit-3	**Stacks, Queues and Its Applications:** Introduction to Stack, Array and Linked List Representation of Stack, Applications of Stacks: Arithmetic Expressions: Polish Notation, Recursion, Tower of Hanoi Problem, Queues: Linked Representation of Queues, Circular queue, Deques, Priority Queues.	6
Unit-4	**Tree** Basic Tree Terminologies and Representing Binary Trees in Memory, Traversing Binary Trees, Header Nodes; Threads, Threaded Binary Trees, Binary Search Trees, Searching and Inserting in Binary Search Trees, Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees, Heap and Heapsort, Pathlengths; Huffmanôs Algorithm. General trees.	6
Unit-5	**Graph and Their Applications** Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshallôs Algorithm; Shortest Paths, Linked Representation of Graph, Traversal algorithms, Operations on Graph, BFS, DFS, Spanning Trees	6
Unit-6	**Sorting And Hashing** Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort, Performance and Complexity Analysis of various Sorting Methods, Hashing.	6
	Total	**36**

Text Books:

1. ñIntroduction to data structures with Cò by Seymour lipschutz.
2. Fundamentals of Data Structuresò, Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.

References:

1. Algorithms, Data Structures, and Problem Solving with C++ò, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. Data Structures through C by YashwantKanetkar

5ETC05 Open Elective - I (OE-I): (iii) INTRODUCTION TO JAVA

Course Pre-Requisite:

1. 3ETC05 Object Oriented Programming.

Course Objectives:

1. To Learn basics of programming
2. To understand the foundation of Object-Oriented Programming
3. To learn basic principles of Object-Oriented Programming
4. To study the process of building an application in a modular fashion using Java Programming Language

Course Outcomes:

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

1. Fundamentals of Object Oriented Programming and can build & run a basic application at their own
2. Use of selection & repetition statements in Java Program, dealing with methods and playing with classes and objects in real world
3. To create and process single dimensional & multidimensional arrays, to handle strings in Java
4. To create interactive graphical user interface in a desktop application using AWT and/or SWING Components.
5. To handle exceptions and create user defined exception, also learns file handling in Java.
6. To learn concept of multithreading; create, manage threads; and purpose of synchronization.

	Subject: INTRODUCTION TO JAVA	L
Unit-1	**Java Basics:** History of Java, Characteristics of Java, Types of Java Program, an introduction to Classes & Objects, Messages & methods, introduction to Inheritance, Software Engineering & Software Life Cycle, Structure of a java application, Edit-Compile-Run cycle of a java program. **Java Building Elements**: Identifiers, Variables, Constants, Data types, Arithmetic Expressions, Standard Input & Output, Programming Style & Documentation **Control Structure:** Selection Statements- if, ifé else, Nested if, switch. Repetition Statements- for loop, While loop & do loop, using break & Continue.	6
Unit-2	**Methods:** Creating Methods, Calling a method, Overloading Methods, Concept of Recursion **OOP:** Objects & classes, Passing Objects to methods, Instance Variables & class Variables, Instance Methods & Class Methods, Scope of Variables, Introduction to Packages, the Math Class **Arrays:** Declaring & Creating Arrays, Initializing & Processing Arrays, Array of Objects, Multidimensional arrays.	6
Unit-3	**Strings:** The String Class, The String Buffer Class, The String Tokenizer Class, Command Line Arguments **Inheritance:** Super classes and Subclasses, the super keyword, the *this*keyword, the Object class, the final and abstract modifiers, the concept of Wrapper Classes, Introduction to Interfaces.	6
Unit-4	**Graphics Programming:** The AWT Class Hierarchy, Frames, Event Driven Programming (Delegation Event Handling Model), Layout Managers, Panels, The Color Class, The repaint(), update() and paint(), Methods, Drawing Lines & different shapes, introduction to adapter classes. **Creating GUI:** Button, Label, Text Field, Text Area, Choice, List, Checkbox, Dialog, Menu, Creating Multiple Windows, introduction to swing components.	6
Unit-5	**Exception Handling:** Exceptions & Exception Types, Understanding Exception Handling, Creating Exception classes, the finally clause. **File Input & output:** File & J File Chooser Objects, Low-Level File I/O, High Level File I/O.	6
Unit-6	**Multi-Threading:** Concept of thread, The Thread class, The runNable interface, Thread Life cycle, Thread Priority, Thread Groups, concept of synchronization.	6
	Total	**36**

Text Books:

1. Y. Daniel Liang, ñAn Introduction to Java Programmingò Eastern Economy Edition, PHI
2. C. Thomas Wu, ñAn Introduction to Object-Oriented Programming JAVAò, Fourth Edition, Tata McGraw Hill

References:

1. Kathy Sierra & Bert Bates, ñHead First Javaò, OôREILLY
2. E Balagurusamy, ñProgramming with JAVA, A Primerò, Third Edition, TMH

5ETC06- MICROCONTROLLER- LAB

Å Minimum Eight Experiments based on syllabus of **5ETC01: MICROCONTROLLER** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC07- DIGITAL SIGNAL PROCESSING LAB

Å Minimum Eight Experiments based on syllabus of **5ETC03: DIGITAL SIGNAL PROCESSING** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC08- POWER ELECTRONICS LAB

Å Minimum Eight Experiments based on syllabus of **5ETC04: PE(1): (i) POWER ELECTRONICS** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC09: ELECTRONIC LAB BASED ON INSTRUMENTATION

Course Outcomes:

At the end of this course student will demonstrate the ability to

1. Learn about various Sensors
2. Examine the measurement of various physical quantities using transducers
3. be aware of statistical data analysis of different transducers
4. Understand computerized data acquisition

Minimum Eight Experiments from the list give must be conducted

List of Experiments:

1. Temperature measurement using temperature sensor.
2. Measurement of linear displacement using LVDT.
3. Study of instrumentation amplifier
4. Measurement of force using strain gauge
5. Measurement of Pressure using Piezo-electric Transducer.
6. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
7. Displacement measurement by Capacitive Transducer
8. Temperature measurement by thermistor.
9. Liquid level measurement using level transducers.
10. Displacement measurement by resistive Transducer.
11. Comparative study of temperature measurement using: RTD, Thermistor and Thermocouple.
12. Study of Smart Sensors and Data Acquisition Systems

Note:

An orientation program of 15 hours duration / MOOC to be offered to the students during

(a) Vthsemester : Indian Constitution

(b) VIthsemester : Indian Traditional Knowledge

B.E. [ELECTRONICS & TELECOMMUNICATION ENGG. (VI SEM)

6ETC01 COMMUNICATION NETWORK

Course Objectives:

1. To understand the general principles of network design and compare the different network Topologies.
2. To understand the general principles of switching and various routing algorithms.
3. To acquire the knowledge of functions and protocols of OSI and TCP/IP models.
4. To understand Application layer Protocols.

Course Outcomes:

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

1. Identify different types of network devices and their functions within a network.
2. Understand the basic functions of data logical link control and media access control and protocol used in this layers.
3. Distinguish between the layers of the OSI and TCP/IP model.
4. Analyze, specify and design routing strategies for an IP based networking infrastructure
5. Understand the concept of reliable and unreliable transfer protocol of data and how TCP and UDP implement these concepts.
6. Understand various Application layer Protocols.

	Subject: 6ETC01 COMMUNICATION NETWORK	L
Unit-1	**Data Communication Network:** A brief history of Internet, Protocols and Standards, Standard Organizations, Need for Protocol Architecture, OSI Reference Model, Overview of TCP/IP architecture, Addresses in TCP/IP. **Types of Network:** LAN, MAN, WAN. Network connecting Devices: Hubs, Repeater, Bridges, Switches, Routers, Gateways. **Network Topology:** Mesh, Bus, Tree, Ring, Star.	8
Unit-2	**Data Link Control Protocols:** Need for Flow control, Stop and Wait Flow Control, Sliding Window Flow Control, Stop and wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Transmission efficiency of ARQ protocols.	6
Unit-3	**Multiple Access Control Protocols:** Random Access Techniques: ALOHA, Slotted ALOHA, Contention Techniques: CSMA, CSMA/ CD (IEEE 802.3), CSMA/CA.Controlled Access Techniques: Polling, Token Passing. **Medium Access Control Protocols:** Token Bus (IEEE 802.4), Token Ring (IEEE 802.5).	6
Unit-4	**Network layer:** TCP IP Reference Model, IPv4-Classful and Classless Addressing, Virtual circuit and Datagram networks, Router, Routing algorithms, Dijkstraôs Algorithm (Problems expected), Bellman Ford Algorithm (Problems expected). Traffic Control: Leaky bucket algorithm, Token bucket algorithm.	5
Unit-5	**Transport layer:** Connectionless transport - UDP, Connection-oriented transport ï TCP, Remote Procedure Call. **Congestion Control and Resource Allocation:** Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	5
Unit-6	**Application Layer:** Domain Name Space (DNS), TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP.	6
	Total	**36**

Text Books:

1. B. Forouzan, ñData Communications and Networkingò, 4th Edition, McGraw-Hill.
2. Andrew S. Tanenbaum and David J. Wetherall, ñComputer Networksò, 5th Edition, Pearson Education, Inc.
3. William Stallings, ñData and Computer Communicationò, 8th Edition, Pearson Education, Inc.

References:

1. James F. Kuross, Keith W. Ross, ñComputer Networking A Top-Down Approach Featuring the Internetò, Third Edition, Addison Wesley, 2004.
2. Nader F. Mir, ñComputer and Communication Networksò, Pearson Education,2007.
3. Comer, ñComputer Networks and Internets with Internet Applicationsò, Fourth Edition, Pearson Education, 2003.

6ETC02: COMPUTER ARCHITECTURE

Course Pre-Requisite:

1. 3ETC03 Digital System Design
2. 5ETC01 Microcontroller

Course Objectives:

1. To familiarize the basic concepts and structure of computers
2. To understand different types of instruction formats and concepts of arithmetic operations
3. To learn the concepts of microinstruction, its sequencing and execution.
4. To learn different types of memories and understand memory organization
5. To learn how I/O devices are organised and accessed.
6. To understand the concept of parallel processing and multi-processor architecture.

Course Outcomes:

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

1. Learn how computers work
2. Analyse the performance of computers
3. Perform floating point arithmetic operations and design ALU as per the requirement
4. Know how computers are designed & built
5. Understand and design different types of memory systems
6. Understand issues affecting recent processors

	Subject: 6ETC02: COMPUTER ARCHITECTURE	L
Unit-1	**Basic Structure of Computers:** Hardware & software Functional units, Basic operational concepts, Bus structures, addressing methods and Machine program sequencing: Memory locations, Addresses, Instruction and Instruction sequencing, Addressing modes, Basic I/O operations.	8
Unit-2	**Processing Unit:** Processor organization, information representation, number formats, Instruction sets and its implementation. Arithmetic operation, ALU design, Floating point arithmetic, IEEE 754 floating point formats.	6
Unit-3	**Control Unit:** Micro operation, control of processor Hardwired implementation, micro program control: Concepts, microinstructions sequencing and execution, application of microprogramming.	6
Unit-4	**Memory Unit :**Concept of virtual memory, Memory hierarchies, Main memory allocation, Replacement policies, segments and pages, file organization, High speed memory, inter-board memories, Cache memories, Associative memories.	5
Unit-5	**I/O Organization :** Accessing I/O devices, Interrupts, Enabling and disabling interrupts, handling multiple devices, DMA, I/O Hardware, Standard I/O interfaces.	5
Unit-6	**Parallel Processing:** Basic concepts, types of parallel processors. Pipeline processor: Pipeline types, design, structures, Multiprocessors: Types, performance, parallel programming, Multiprocessor Architecture, interconnect network	6
	Total	**36**

Text Books:

1. Hayes J.P, ñComputer Architecture and Organizationò, PHI, Second edition
2. A.S.Tanenbum, ñStructured Computer Organizationò, PHI, Third edition
3. M.M.Mano, ñComputer System Architectureò, Edition

References:

1. V.Carl Hammacher, ñComputer Organisationò, Fifth Edition
2. Y.Chu, "Computer Organization and Microprogrammingò, II, Englewood Chiffs, N.J., Prentice Hall Edition
3. C.W.Gear, ñComputer Organization and Programmingò, McGraw Hill, N.V. Edition

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (I) CMOS DESIGN

Course Pre-Requisite:

1. 3ETC02 - Electronic Devices & Circuits.
2. 3ETC03 - Digital System Design

Course Objectives:

1. To study CMOS transistor theory and performance parameters.
2. To study layout design rules for size & power optimization.
3. To understand the concept of combinational CMOS circuit design.
4. To implement the concept of sequential circuit in CMOS design.
5. To learn the dynamic CMOS logic circuit

Course Outcomes:

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

1. To understand the concept of CMOS circuit.
2. To draw Layout, Stick diagrams of CMOS Circuits.
3. To analyses the CMOS circuit performance parameter
4. To implement combinational CMOS circuit design using CMOS logic families.
5. To design sequential CMOS circuit.
6. To design the CMOS circuit using dynamic CMOS logic

		L
	Subject: CMOS Design	
Unit-1	**BCMOS Device Fundamentals:** Mooreôs Law, MOS structure capacitance, Channel capacitance, Junction capacitance,Review of MOS transistor models, Non-ideal behaviour of the MOS Transistor. Transistor as a switch, CMOS Inverter and its Characteristics.	8
Unit-2	**VLSI Circuit Design Processes:** VLSI Design Flow, CMOS Process enhancements ï Interconnect, Circuit Elements, CMOS Lambda-based Design Rules, Stick Diagrams, Physical layout of simple CMOS Logic Gates, RC Parasitic, CMOS Fabrication [P-well process, N-well process].	6
Unit-3	**CMOS Performance Parameter:** Introduction to Delays in CMOS,RC Delay model, linear delay model, logical path efforts. Power, interconnect and Robustness in CMOS circuit layout.	6
Unit-4	**Combinational Circuit Design:** CMOS logic families, CMOS logic gates design, Complex CMOS circuit, Transmission gate, Pass transistor logic.	5
Unit-5	**Sequential Circuit Design:** Design of latches and Flip-flops, Static Read - Write Memory (SRAM) Circuits (6T), Dynamic Read-Write Memory (DRAM) Circuits (3T).	5
Unit-6	**CMOS Clocking Styles:** CMOS Clocking Styles, Clocks Skew, Clock distribution techniques, Clock Jitter. **Dynamic Logic Circuit:** Dynamic Pass transistor logic, Dynamic CMOS logic, Domino logic, NORA logic.	6
	Total	**36**

Text Books:

1. S. M. Kang and Y. Leblebici, ñCMOS Digital Integrated Circuits: Analysis and Designò, 3rd Edition, MH, 2002.
2. Neil H. Weste, D. Harris, ñPrinciples of CMOS VLSI design A Circuit & System Perspectiveò 4th Edition, Pearson (Addison-Wesley), 2011.
3. Wayne Wolfe, ñModern VLSI Design: IP based Approachò, 4th Edition, PHI.
4. Jan M. Rabaey, A. Chandrakasan, B. Nikolic, ñDigital Integrated Circuits: A Design Perspectiveò, 2nd Edition, Pearson

References:
1. S.K. Ghandhi, ñVLSI Fabrication Principlesò, John Wiley Inc., New York, 1994 (2nd Edition).
2. Plummer, Deal, Griffin, ñSilicon VLSI Technology: Fundamentals, Practice &Modelingò PH, 2001.
3. S.M. Sze (Ed), ñVLSI Technologyò, McGraw Hill.
4. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979.

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (II) SATELLITE COMMUNICATION

Course Pre-Requisite:

1. 3ETC04 Electromagnetic Waves
2. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To understand the frequency bands used in satellite communication
2. Toknowthebasicsoforbitalmechanism,thetypesof satelliteorbitsandorbitalaspectsof Satellitecommunication.
3. To understand the various typical phenomenon in satellitecommunication.
4. To understand different satellite channel parameters.
5. To understand the working of different satellitesubsystems
6. To understand the various services ofsatellite.

Course Outcomes:

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

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

1. Visualizethearchitectureof satellitesystems as ameansof highspeed,highrange communicationsystem.
2. Statevariousaspectsrelatedtosatellitesystemssuchas orbitalequations,sub-systemsin asatellite
3. Solvenumerical problemsrelatedtoorbitalmotionanddesignoflinkbudgetforthe given parametersandconditions.
4. Learnadvancedtechniquesandregulatoryaspectsofsatellitecommunication
5. Understand role of satellite in variousapplications
6. Understand VSAT and GPS

	Subject: Satellite Communication	L
Unit-1	**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication, satellite types ï LEO, MEO, GEO, HEO.	6
Unit-2	**Orbital Mechanics:** Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity, look angle determination of a satellite, concepts of Solar day and Sidereal day. Geo stationary and non-Geo- stationary orbits.	6
Unit-3	**Typical Phenomena in Satellite Communication :**Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift, space launch vehicles.	6
Unit-4	**Satellite Channels:** Electromagnetic field propagation, Atmospheric losses, Receiver noise, Carrier to Noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis, Frequency reuse and depolarization.	6
Unit-5	**Satellite sub-systems:** Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc. Satellite link budget.	6
Unit-6	**Very Small Aperture Satellite (VSAT):** Overview of VSAT system, Network architecture, Access control protocols, Signal format, Modulation coding and interference issues, VSAT antennas, Transmitter and Receiver, Link analysis for VSAT network. **Satellite Navigation and Global Positioning System (GPS):** Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS.	6
	Total	**36**

Text Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E.Allnutt: Satellite Communications: Wiley India. 2nd Edition, 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill,2009

Reference: Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (III) ADAPTIVE SIGNAL PROCESSING

Course Pre-Requisite:

1. 3ETC01 Engineering Mathematics-III
2. 4ETC04 Signals and Systems
3. 5ETC03 Digital Signal Processing

Course Objectives:

1. To introduce with adaptive signal processing and adaptive systems.
2. To be acquainted with desired response,mean square error performance and Wiener Filters.
3. To make familiar with gradient search algorithms and functions.
4. To Understand LMS algorithms and its performance analysis.
5. To Understand Linear LeastSquare Estimation and RLS algorithms
6. To study the applications of adaptive signal processing

Course Outcomes:

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

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

1. Comprehend adaptive system and functions.
2. Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters.
3. Understand the concepts of gradient and mean square error performance in adaptive systems
4. Analyse convergence and stability issues associated with adaptive filter design and come up with optimum solutions.
5. Apply an adaptive filter algorithm that recursively finds the coefficients that minimize a weighted linear least squares cost function.
6. Implement applications of adaptive signal processing.

	Subject: Adaptive Signal Processing	L
Unit-1	**Adaptive Systems:** AdaptiveSystems: Definition and characteristics,General Properties, Applications and examples of an adaptive system. Review of probability, random variables and random processes.	6
Unit-2	**Wiener Filters:** Input signal and weight vectors, desired response and error, Mean Square Error (MSE), Principleof Orthogonally, FIR Wiener Filters, Wiener Hopfequation.	6
Unit-3	**Steepest Descent Algorithms:** Searching the performance surface ï Methods & Ideas of Gradient Search methods ï Gradient Searching Algorithm & its Solution ï Stability & Rate of convergence ï Learning Curves Gradient Search by Newtonôs Method, Method of Steepest Descent, Comparison of Learning Curves.	6
Unit-4	**Least Mean Square (LMS) Algorithms:** Derivation of LMS algorithm, Convergence, Stability and performance analysis of LMS Algorithm, Normalized Least-Mean-Square Algorithm.	6
Unit-5	**Recursive Least Square Algorithms:** Linear LeastSquare Estimation Problem, Introduction to RecursiveLeast-Squares Adaptive filters, Matrix Inversion Lemma, RLS Algorithm.	6
Unit-6	**Applications of Adaptive filtering:** System identification, Adaptive Equalization, noise cancellation, linear prediction, Echo Cancellation, Lattice Filters.	6
	Total	**36**

Text Books:

1. "Adaptive Filter Theory", Simon Haykin, 3rd Ed, Prentice HallInc, 2002.
2. Bernard Widrow & Samuel. D. Stearns, ñAdaptive Signal Processingò, Pearson Edu, 2001.

References:
1. "Adaptive Filtering Primer with MATLAB", Alexander D.Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS Press.
2. "Adaptive Signal Processing", Bernard Widrow, Prentice-HallSignal Processing Series.
3. ."Real Time Digital Signal Processing: Implementation and Applications", Sen M. Kuo, Bob H. Lee and Wenshun Tian,2nd Ed, John Wiley & Sons, 2006.
4. "Adaptive Digital Filters", Maurice G Bellanger, 2nd Edition,
5. "Adaptive Nonlinear System Identification", Marcel DekkarInc. T Ogunfummi, Springer

6ETC04 Open Elective - II (OE-II): (i) INTRODUCTION TO PYTHON PROGRAMMING

Course Pre-Requisite:
1. (3ETC05) Object Oriented Programming

Course Objectives:

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings functions.
3. Illustrate the process of structuring the data using Lists, Tuples, Sets and Dictionary.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. To understand steps involved in Python to Mongo DB communication.

Course Outcomes:

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

1. Interpret the fundamental Python syntax and semantics
2. Be fluent in the use of Python control flow statements
3. Perform basic CURD operations on Mongo DB using Python.
4. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, tuples and sets.
5. Identify the commonly used operations involving file systems and regular expressions.
6. To learn and use operators

	Subject: INTRODUCTION TO PYTHON PROGRAMMING	L
Unit-1	**Parts of Python Programming Language:**What is Python?, Features of Python, Identifiers, Keywords, Statements and Expressions, Variables, Data Types, Constants, Escape characters, Comments	6
Unit-2	**Operators:** Arithmetic Operators, Assignment Operators, comparison Operators, Logical Operators, Bitwise Operators, Membership Operator, Precedence and Associativity.	6
Unit-3	**Control Flow Statements:** Conditional statements: if, if-else, if-elif-else, Iterative statements: for, while Loops, Transfer statements: break, continue, pass.	6
Unit-4	**Tuples, Sets and Dictionaries:** List:Creation of List Objects, List Methods, Tuples: Creation of Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Sets: Sets Set Methods, Dictionary : Creation of Dictionary, Accessing, Modifying and Deleting Elements.	6
Unit-5	**Functions:** Built in Functions,User Defined Functions, Types of Arguments: Positional Arguments, Keyword Arguments, Default Arguments, Variable Length Arguments, Lambda expressions..	6
Unit-6	**Object Oriented Programming, MongoDB with Python3:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Mongo DB with Python3: Introduction to Mongo DB, use of pymongo, Steps in Python to MongoDB communication, Basic *CRUD* Operations.	6
	Total	**36**

Text Book:
1. Gowrishankar S, Veena A, **"Introduction to Python Programming",** 1st Edition, CRC Press/Taylor & Francis, 2019. ISBN-13: 978-0815394372

References:

1. Martin C. Brown, ñPython: The Complete Referenceò, Mc-Graw Hill Education (India) Edition 2018, New York
2. Niall O'Higgins, "MongoDB and Python", Oõ Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, ISBN: 9781449310370.
3. Yashavant Kanetkar, Aditya Kanetkar, ñLet Us Pythonò, bpb publication, 3rd Edition Dec.2020, ISBN : 9789389898521
4. R. Nageswara Rao, ñCore Python Programmingò, Dreamtech Press; 2nd edition, ISBN : 978-9386052308.
5. Paul Barry, :Head-First Python: A Brain-Friendly Guideò (2nd Edition), Shroff Publishers, ISBN: 9789352134823.

6ETC04 Open Elective - II (OE-II): (ii) DATABASE MANAGEMENT SYSTEM

Course Pre-Requisite: None

Course Objectives:

1. Basic knowledge of file structure and Data Base.
2. Knowledge of Entity Relation Diagram and data Modeling.
3. The basic knowledge of SQL query and structure.
4. The process of building normalization and apply to the database system.
5. Gaining the knowledge of transaction which applied on database.
6. Understanding the issues of concurrency and dead lock control.

Course Outcomes:

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

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.
3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
5. Understand the basic issues of transaction processing
6. Understanding the basic issues of concurrency control and dead lock in database.

	Subject: DATABASE MANAGEMENT SYSTEM	L
Unit-1	**Introduction to Database Systems:** Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Transaction Management, Database System Structure, Application architectures. Entity Relationship Model, Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema	6
Unit-2	**Data modelling using ER model (Entity Relationship Model):** Relational Model: Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus.	6
Unit-3	**SQL Structure:** SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views. Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL	6
Unit-4	**Normalization:** Purpose of Normalization, Data Redundancy and Anomalies, Non-Loss decomposition and Functional Dependencies, First, Second and Third Normal Forms, Boyce/Codd Normal Form (BCNF)	6
Unit-5	**Transaction Processing:** The Concept of Transaction, States of Transaction, Concurrent Execution of Multiple Transactions, Serializability - Conflict and View Serializability	6
Unit-6	**Concurrency Control and Dead Lock: Concurrency Control and Deadlock Recovery:** Lock Based Protocols - Two Phase Locking Protocol and Time Stamp Based Protocol, Types of Locks, Deadlock Handling - Deadlock Detection, Deadlock Recovery, Deadlock Prevention	6
	Total	**36**

Text Book: Korth, and Sudarshan: Database System Concept, McGraw Hill, 4th Edition.

References:

1. Raghu Ramkrishnan :ò Database Systemò. McGraw Hill
2. C.J.Date : ñDatabase Systemò, 7th ed. (Pearson Education)
3. Connolly &Begg, : Database System,Low Price Ed.
4. Nawathe& Al-Masseri ñ Database Systemsò (Pearson Education)

6ETC04 Open Elective - II (OE-II): (iii) RENEWABLE ENERGY SOURCES (SOLAR & ELECTRIC VEHICLES)

Course Pre-Requisite: None

Course Objectives:

1. To learn the concept of Solar cell
2. To understand Solar Photovoltaic systems
3. Understand the working of hybrid electric vehicles
4. The process of building normalization and apply to the database system.
5. Gaining the knowledge of electric drives and storage

Course Outcomes:

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

1. Understand the concept of Solar cell and estimate solar energy availability
2. Learn Solar cell Technologies
3. Understand the concept of Power Electronic Converters
4. Learn about Hybrid Electric Vehicles
5. Learn Electric drives
6. Learn about electric storage

	Subject: **(iii) RENEWABLE ENERGY SOURCES (SOLAR & ELECTRIC VEHICLES)**	L
Unit-1	**Solar Cell Fundamentals and Solar Resource** Place of PV in World Energy Scenario, P-N Junction Diode: An Introduction to Solar Cells, solar radiation spectra, solar geometry, Earth Sun angles, and observer Sun angles, solar day length, Estimation of solar energy availability.	6
Unit-2	**Solar Cell Technologies** Production of Si, Si Wafer-based Solar Cell Technology, Advances in c-Si Cell Processes Suitable for Near Future Commercialization, Solar Cell Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array.	6
Unit-3	**Solar Photovoltaic Systems and Applications** Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control, Grid-Connected System and Standalone system, Solar Water Pumps, Solar street lights, Battery sizing.	6
Unit-4	**Introduction to Hybrid Electric Vehicle** Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Electric Vehicle Evolution, Types of EVs, Types of battery for EVs.	6
Unit-5	**Electric Drives:** Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor.	6
Unit-6	**Energy Storage:** Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles: - Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis.	6
	Total	**36**

Text Books:

1. Chetan Singh Solanki, ñSolar Photovoltics- Fundamentals, Technologies And Applicationsò PHI third Edition.
2. D. P. Kothari, K. C. Singal and Rakesh Ranjan, ñRenewable Energy Sources and Emerging Technologiesò, PHI Second Edition.
3. A. K. Babu, Electric and Hybrid Vehicles, Khanna Publishers, 2019
4. S. P. Sukhatme and J.K. Nayak, ñSolar Energy: Principles of Thermal Collection and Storageò, McGraw Hill, 3 rd ed., 2008.
5. G. N. Tiwari and M. K. Ghosal, ñRenewable Energy Applicationsò, Narosa Publications, 2004.

References:

1. G. M. Masters, ñRenewable and Efficient Electric Power Systemsò, John Wiley and Sons, 2004.
2. J. A. Duffie and W. A. Beckman, ñSolar Engineering of Thermal Processesò, John Wiley & Sons, 1991
3. B.H. Khan, ñNon-Conventional Energy Resourcesò, McGraw Hill 2nd Edition 2017.
4. Emadi, A. (Ed.), Miller, J., Ehsani, M., ñVehicular Electric Power Systemsò Boca Raton, CRC Press, 2003
5. Husain, I. ñElectric and Hybrid Vehiclesò Boca Raton, CRC Press, 2010.
6. Larminie, James, and John Lowry, ñElectric Vehicle Technology Explainedò John Wiley and Sons, 2012

6ETC05: ENGINEERING ECONOMICS

Course Pre-Requisite:

1. 3ETC03 Digital System Design
2. 5ETC01 Microcontroller

Course Objectives:

1. To familiarize the basic concepts and structure of Engineering Economics
2. To understand different principles of Engineering Economics
3. To learn the concepts Production and cost associated with it
4. To learn different types of cash flow
5. To learn depreciation analysis
6. To understand the concept of Banking system in India

Course Outcomes:

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

1. Learn basics of Engineering Economics
2. Understand and compute the production cost
3. Study different cash flow methods
4. to evaluate Engineering alternatives
5. Understand depreciation analysis
6. Understand Indian Banking System

	Subject: 6ETC05: ENGINEERING ECONOMICS	L
Unit-1	Definition and Scope of Engineering Economics , Subject Matter of Economics, Principles of Engineering Economics, Micro-economics Vs Macro-economics , Utility Analysis, Laws of diminishing utility analysis, derivation of demand curve and law of Demand, Elasticity of demand	6
Unit-2	Theory of Production: Theory, Importance, Isoquants and its properties, Marginal rate of Technical substitution, Law of variable proportions, Returns to Scale, Cost of Production and Cost of Curves, The law of supply, Price determination	6
Unit-3	Time value of Money, Techniques for adjusting time value of money, Uniform Gradient series factor, annuity, annuity due, calculation of deferred annuity , Types and components of cash flow, cash flow diagrams, principles of equivalence, Uses, significance and limitation of Cash flow statement	6
Unit-4	Evaluation of Engineering alternatives, Present worth method, Future worth Method, Equivalent annual worth comparison , Rate of return method, Project evaluation and Cost benefit analysis	6
Unit-5	Depreciation Analysis, Causes of depreciation, Depreciable property, depreciation methods, Digit method, Break even analysis, determination of breakeven point, Breakeven point in terms of quantity, sales and as percentage of capacity, Break even chart, Breakeven analysis assumptions, Managerial uses, Limitations	6
Unit-6	Commercial Banking, Functions of Commercial Banks , Role of Commercial banks in developing economy, sound baking system for under-developed countries, types of banks, balance sheet of a bank, New developments in banking system.	6
	Total	**36**

Text Book: Engineering Economics and Costing, Second Edition, PHI, 2010 by Sasmita Mishra

References:

1. Engineering Economic Analysis, Volume 2, By Donald G. Newnan, Ted Eschenbach, Jerome P. Lavelle · 2004
2. ENGINEERING ECONOMICS, PHI Learning, By R. PANNEERSELVAM · 2013

SUBJECT (PR): 6ETC06 COMMUNICATION NETWORK LAB

- **Minimum Eight** Experiments based on syllabus of 6ETC01 **Communication Network** must be conducted.
- Course Objectives and Course Outcomes shall be specified based on the experiments conducted

6ETC07- ELECTRONIC CIRCUIT DESIGN LAB (HARDWARE/SOFTWARE)

Expt. No.	Name of Experiment
1	Layout, physical verification, placement & route for design, static timing analysis, Parametric analysis of CMOS Inverter on silicon using appropriate ASIC design tool.
2	Layout, physical verification, placement & route for design, static timing analysis of two input NAND and NOR logic gates on silicon using appropriate ASIC design tool.
3	Layout, physical verification, placement & route for design, static timing analysis, Parametric analysis of D Flip-flop on silicon using appropriate ASIC design tool.
4	Layout, physical verification, placement & route for design, static timing analysis, Parametric analysis of f=(A.B+C.D) on silicon using appropriate ASIC design tool.
5	To write Verilog code for BCD Counter and simulate with test bench.
6	To write Verilog code for 2-to-4 decoder and simulate with test bench, synthesis, implement on PLD.
7	To write Verilog code for 8-to-1 Multiplexer and simulate with test bench, synthesis, implement on PLD.
8	To write Verilog code for D flip-flop with reset and simulate with test bench, synthesis, implement on PLD.
9	ilog code for 4 Bit Full Adder in Module instantiation simulate with test bench, synthesis, implement on PLD.
10	To write Verilog code for sequence detector-1111 and simulate with test bench, synthesis, implement on PLD.

Subject (Pr): 6ETC08 Python Programming Lab

- **Minimum Eight** Experiments based on syllabus of 6ETC04 OE-II Introduction to Pythonmust be conducted.
- Course Objectives and Course Outcomes shall be specified based on the experiments conducted

6ETC09: MINI PROJECT

Course Name	Course Code	Examination Scheme					
		Theory		Practical			
		Internal Assessment	University Assessment	Internal Assessment			University Assessment
				Term work	Presentation & Demo	Total	
Mini Project	6ETC09	--	--	25	25	50	--

Course Objectives:

1. To acquaint with the process of identifying the needs and converting it into the problem.
2. To familiarize the process of solving the problem in a group.
3. To acquaint with the process of applying engineering fundamentals to attempt solutions to the problems.
4. To inculcate the process of self-learning and research.

Course Outcomes:

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

1. Identify problems based on societal /research needs.
2. Apply Knowledge and skill to solve societal problems in a group.
3. Develop interpersonal skills to work as member of a group or leader.
4. Analyze the impact of solutions in societal and environmental context for sustainable development.
5. Excel in written and oral communication.
6. Demonstrate project management principles during project work.

Guidelines for Mini Project

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor/head of department.
- Students shall submit implementation plan, which will cover weekly activity of mini project.
- A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record comments.
- Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
- Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- The solution to be validated with proper justification and report to be compiled in standard format.
- With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Mini Projects, it is preferable that a single project of appropriate level and quality to be carried out by all the groups of the students.

Guidelines for Assessment of Mini Project:

Term Work:

- The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews in the semester.
- In continuous assessment focus shall also be on each individual student, assessment based on individualôs contribution in group activity, their understanding and response to questions.
- Distribution of Term work marks for both semesters shall be as below;
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Marks awarded by guide/supervisor based on log book:	**10**
Marks awarded by review committee:	**10**
Quality of Project report:	**5**

Guidelines for Assessment of Mini Project Practical/Oral Examination:

- Report should be prepared as per the guidelines issued by the College.
- Mini Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners
- Students shall be motivated to publish a paper based on the work in Conferences/students competitions.

Assessment criteria of Mini Project

Mini Project shall be assessed based on following criteria;

1. Quality of survey/ need identification
2. Clarity of Problem definition based on need.
3. Innovativeness in solutions
4. Feasibility of proposed problem solutions and selection of best solution
5. Cost effectiveness
6. Societal impact
7. Full functioning of working model as per stated requirements
8. Contribution of an individualôs as member or leader
9. Clarity in written and oral communication

Note:

An orientation program of 15 hours duration / MOOC to be offered to the students during

(a) Vth semester : Indian Constitution

(b) VIth semester : Indian Traditional Knowledge

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