ET301U AUTOMATIC CONTROL SYSTEMS

Teaching Scheme	**:** 02L+ 00 T; Total: 02	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30 MSE+ 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to lay the foundation for further studies in areas such as communication, signal processing and power electronics systems etc. This course will explore the basic concepts, types of control systems and their components, mathematical modeling of physical systems using transfer function, stability of the system, time and frequency response analysis and design of the system. In this course, more emphasis is given on analysis and design of systems in continuous time.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic mathematics, electrical and electronics engineering, electric and magnetic circuit concepts, electric machines fundamentals

COURSE OBJECTIVES

The objectives of offering this course are to

1. learn and understand the need for automation of systems
2. make a strong foundation in types of feedback used in the control system and its applications
3. introduce the students with the transient and steady state response of the system
4. explore the concept of time domain and frequency domain analysis

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. describe the fundamental concept and principle of feedback control system
2. solve differential equations and apply the knowledge to engineering problems conversion of mechanical to electrical systems and vice versa
3. gain knowledge regarding time domain analysis and stability of control system
4. create an ability among the students to analyze control systems using root locus and frequency domain methods

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2										1	1	
2	3	2	2	1	1								1	1	
3	3	3	3	2	2								1	1	
4	3	2	2	2	1								1	1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Control System Engineering

Introduction, open loop, closed loop system with examples, servomechanism, history and development of automatic control, digital computer control, application of control theory in non-engineering fields, the control problem; mathematical models of physical systems, differential equations of physical systems, transfer functions, block diagram algebra, signal flow graphs, conversion of block diagram algebra to signal flow graph, feedback characteristics of control systems

Time Response Analysis and Design Specifications

Standard test signals, time response of first and second order systems, steady-state errors and error constants, effect of adding a zero to a system, design specifications of second order systems

Concept of Stability and Root Locus Technique

Concept of stability, necessary conditions for stability, Routh-Hurwitz stability criterion, relative stability analysis, root locus concept, construction of root loci, root contours, effect of addition of open loop poles and zeros

Frequency Response Analysis

Introduction, correlation between time and frequency response, basics of magnitude and phase plot, construction of bode plot, all pass and minimum-phase systems; Nyquist stability criterion, assessment of relative stability using Nyquist criterion; Introduction to Controllers: On Off, PID controllers

Text Books

1. Control Systems Principles and Design, M. Gopal, 16th Reprint, McGraw Hill Education Pvt. Ltd., 2015
2. Modern Control Engineering, K. Ogata, 5th edition, Prentice Hall of India, 2010

Reference Books

1. Automatic Control Systems, B. C. Kuo, 4th edition, Prentice Hall of India, 2010
2. Schaum's Outline, Control System, J. J, Distefano III, A. R. Stubberud, I. J. Williams, 3rd edition, Tall McGraw Hill, 2012
3. Nise's Control System Engineering, Dr. R. Gupta, 1st edition, Willey India Publication, 2011
4. Control System Engineering, S. K. Bhattacharya, 3rd edition, Pearson, 2013
5. Matlab and Simulink for Engineers, A. K. Tyagi, 1st edition, Oxford University Press, 2012

ET302U MICROPROCESSORS AND MICROCONTROLLERS

Teaching Scheme : 03L+ 00T Total: 03 **Credit** : 03
Evaluation Scheme : 10 ISA+30MSE +60ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

The course explores knowledge of microprocessors and microcontrollers fundamentals. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications etc.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic number systems and digital electronics fundamentals

COURSE OBJECTIVES

The objectives of offering this course are to

1. meet the challenges of growing technology, student will be conversant with the programmable aspect of microprocessors and microcontrollers
2. programming is a process of problem solving and communication in language of mnemonics
3. understand microprocessor and microcontroller technology concepts and develop skill in both hardware and programming

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. apply basic programmable logic principles and design concepts
2. know the pin configuration and memory organization of a typical microprocessor
3. understand operation and control of microprocessor and microcontroller based systems
4. develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts and apply techniques for measurement of electrical, mechanical quantities, etc. by microprocessor and microcontrollers
5. design microprocessor based system for industrial and domestic applications

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	2								3		
2	3	2	2	2	2								3		
3	3	2	2	2	2								3		
4	3	2	2	2	2								3		
5	1	3	2	2	2								3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Microprocessors

Introduction, Evolution of microprocessors, 8085, 8086/ 80xxx up to Pentium :architectural features, instruction set, addressing modes, simple machine language programming, timing diagrams, interrupt handling, interface of peripherals , applications, advance features like instruction queue, MN/MX mode of 8086 , virtual memory, floating point ALU, etc; microprocessor system design, introduction to PIC microcontrollers

8051/ 89c51/D5000/xx Microcontroller Introduction

Overview of the microcontroller family, block diagram description of 8051, architectural features, memory and register organization, stack and its operation, stack related instructions, looping, conditional and unconditional jumps, subroutines, time delay calculations, CALL and RET Instruction.8051 pin diagram, understanding the function of each pin, I/O port structure and I/O port programming

Microcontroller 8051 Assembly Language Programming

Addressing Modes in 8051; Instruction set of 8051 microcontroller; Programs based on instructions; Timer, serial port and interrupt programming: Structure of Timer Mode Control Register (TMOD register), Mode 1 programming. Generation of large delay, Mode 2 programming counter programming, Timer Control Register (TCON register) structure; 8051 serial port programming; 8051 interrupts, interrupts programming

Interfacing Devices with Microcontroller 8051/89C51 and Programming

Interfacing: switch, LED, LCD, ADC, DAC, sensors, stepper motor, relay, DS12887 Real Time Clock (RTC); serial communication protocols: Inter Integrated Circuit (I2C), Serial Peripheral Interface (SPI), MODBUS; interfacing to external memories, flash programming

Text Books

1. Microprocessor Architecture, Programming and Applications with 8085, R.Gaonkar, 6th edition, Penram International Publishing, 2013
2. Intel Microprocessors, B. B. Brey, 8th edition, Pearson Education Asia, 2015
3. The 8051 Microcontroller and Embedded Systems, M.A. Mazidi and J. G. Mazidi, 2nd edition, Pearson Education Asia, 2006
4. Microprocessor 8086, L. Gibbson, 4th edition, Tata McGraw Hill

Recommended Books

1. Microprocessor and Programmed Logic, K. L. Short, 2nd edition, Pearson Education Asia, 1987
2. Microprocessor 8086, Avtarsingh, 4th edition, Tata McGraw Hill, 2009
3. Microcontrollers Architecture, Programming, Interfacing and System Design, Raj kamal, 1st edition, Pearson Education Asia, 2011
4. Microcontrollers [Theory and Applications], A. V. Deshmukh, 1st edition, Tata McGraw Hill, 2005

ET303U DIGITAL COMMUNICATION

Teaching Scheme : 03L + 00 T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA+ 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course will impart the basic concepts of digital communication. In the course, emphasis is given on baseband and band pass pulse modulation schemes. The course also introduces the concepts and applications of spread spectrum modulation schemes. The course is designed to lay the foundation for further studies in the domain of advanced communication systems.

DESIRABLE AWARENESS/SKILLS

Knowledge of analog communication, probability and fundamentals of communication systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. impart the knowledge of principles and analysis of various baseband and band pass modulation schemes
2. develop the ability to analyze various modulation schemes used for digital communication
3. enable the students to demonstrate the knowledge of spread spectrum modulation schemes

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. demonstrate the knowledge of basic building blocks of digital communication systems, digital multiplexing and transmission media
2. analyze the digital baseband modulation schemes namely PCM, DPCM, DM and ADM
3. analyze the digital band pass modulation schemes namely FSK, PSK, QPSK, QAM etc
4. paraphrase the knowledge of spread spectrum modulation schemes

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	3	2							2	3	2	2
2	2	2	2	2	2								3	2	3
3	2	3	3	2	2								2	2	2
4	3	2	2	2	1								3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Baseband Digital Pulse Modulation Schemes

Basic building blocks of digital communication systems, overview of sampling theorem, principle, transmitter and receiver of Pulse Code Modulation (PCM), Differential PCM, Delta Modulation (DM), Adaptive DM, slope overload and granular noise errors in DM and its remedies

Digital Data Transmission

Base band digital communication system, line coding: formats – Non Return to Zero (NRZ), Return to Zero (RZ) (unipolar and bipolar), Manchester, polar quaternary NRZ, Inter-symbol Interference (ISI) and Nyquist's solutions for ISI, scramblers and un-scramblers, eye diagram

Digital Multiplexers and Transmission Media

Concept and types of digital multiplexers, Multiplexing hierarchy, case study of T-1 digital multiplexing hierarchy and computation of its output bit rates and bandwidth, quasi-synchronous multiplexing, transmission media such as wire-pair cables, coaxial cables, radio systems, optical fiber, etc.

Band-pass Digital Pulse Modulation Schemes

Introduction to band-pass modulation, coherent and non coherent detection schemes, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Differential PSK

M-ary Shift Keying Schemes

Inroduction to M-ary shift keying schemes, transmitter and receiver of Quadrature PSK (QPSK), Quadrature Amplitude Modulation (QAM), 8-QAM, 16-QAM, Minimum Shift Keying (MSK)

Spread Spectrum Modulation

principles of Spread Spectrum (SS), Pseudo-Noise (PN) sequences, Direct-Sequence and Frequency Hopping SS (DS-SS and FH-SS) systems, introduction to multiple access techniques, FDMA, TDMA, and CDMA

Text Books

1. Modern Digital and Analog Communication, B.P. Lathi and Zhi Ding, 5th edition, Oxford University Press, 2018
2. Taub`s Principles of Communication Systems, D.L. Schilling, G. Saha, H. Taub, 5th edition, Tata McGraw Hill Publication, 2015

Reference Books

1. Communication Systems, V. Chandra Sekar, 1st edition, Oxford University Press, 2012
2. Communication Systems- Analog and Digital, S.D. Sapre and R. P. Singh, 2nd edition, Tata McGraw Hill, 1995

ET304U DATA STRUCTURES

Teaching Scheme	**:** 02L+ 00T; Total: 02	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA +30MSE +60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

The course provides an introduction to the theory, practice and methods of data structures and algorithm design. The course covers elementary data structures such as stacks, queues, linked lists and trees in C language and the algorithms designed for manipulating these data structures.

DESIRABLE AWARENESS/SKILLS

Knowledge of Computer Fundamentals and C Programming

COURSE OBJECTIVES

The objectives of offering this course are to

1. introduce data structures and algorithm design
2. implement programs using variety of data structures

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. choose the data structures that effectively model the information in a problem
2. judge efficiency trade-offs among alternative data structure implementations or combinations
3. apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures
4. implement and know when to apply standard algorithms for searching and sorting
5. design, implement, test and debug programs using a variety of data structures including lists, stacks, queues, binary tree structures, search trees, graphs

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	2	2	2										1
2	2	2	2	2	2										1
3	2	2	2	2	2										1
4	1	1	1	2	2										1
5	3	3	3	2	2										1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Algorithm and Program Design
Fundamentals: **b**asic terminology, elementary data organization, data structures, data structure operations, Abstract Data Type (ADT)

Algorithm
Complexity, time space tradeoff, algorithmic notations, control structures, complexity of algorithms, sub-algorithms, searching algorithms: algorithms for sequential search, indexed sequential search and binary search

Arrays, Records and Pointers
Sorting algorithms**: s**election, bubble, insertion, quick and merge; Records: structures in C, comparison with arrays as a data structure, array of structures, pointers and structures, polynomial representation using array of structures, unions, bitwise operators

Linked Lists
Singly linked lists: concept, linked list as ADT, representation in memory, traversing, searching, memory allocation; garbage collection, insertion into linked list, deletion from a linked list

Stacks, Queues, Recursion
Stacks: concept, array representation of stacks, linked representation, stacks as ADT, arithmetic expressions; polish notation, application of stacks: recursion, implementation of recursive procedures by stacks; Queues: concept, array representation, linked representation, queue as ADT, circular queues, de-queue (double ended queue), priority queues and applications of queues: categorizing data, simulation of queues

Trees
Binary trees: concept and terminologies, representation of binary tree in memory, traversing a binary tree, traversal algorithms using stacks, header nodes; threads, Binary Search Trees (BST), searching and inserting in BST, deleting in a BST**,** balanced binary trees, application of trees: expression tree, game trees

Text Books

1. Data Structure with C Schaum's Outlines, S. Lipschutz, 1st edition, McGraw Hill Education (India) Private Limited, 2010
2. Data structures using C and C++, Y. Langsam, M. J. Augenstein, Aaron M, Tenenbaum, 2nd edition, Prentice Hall of India Learning, 2009

Reference books

1. Programming in ANSI C, E. Balgurusamy, 6th edition, McGraw Hill Education (India) Private Limited, 2012
2. Data Structures using 'C', ISRD Group, 2nd edition, McGraw Hill Education (India) Private Limited, 2012

ET305U DIGITAL SIGNAL PROCESSING

Teaching Scheme	**:** 03L+ 00T Total: 03	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA +30 MSE+ 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to introduce students to fundamental principles and techniques for Digital Signal Processing (DSP). This course covers representation of discrete signals and systems in time and frequency domain using Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT) and Z transform. In addition, it covers the design of Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters. This course also introduces students to architecture of digital signal processor and basics of implementation of discrete systems on digital signal processor.

DESIRABLE AWARENESS/SKILLS

Knowledge of signals and systems and fundamentals of complex numbers

COURSE OBJECTIVES

The objectives of offering this course are to

1. make strong foundation of discrete time signals and discrete systems
2. strengthen ability of students to analyze discrete time signals and Discrete Time Linear Time Invariant (DTLTI) systems in time domain and frequency domain
3. make familiar with design of digital filters and its implementation on DSP processor

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. represent and analyze discrete systems in time domain
2. analyze discrete signals and DTLTI systems in frequency domain using DTFT, DFT and Z transform
3. design FIR and IIR filters and realize them in direct form, cascade form and parallel form
4. understand architecture of DSP processor and its applications

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2										3	1	
2	2	2	3	2	3								3	2	
3	3		3	2									3	3	
4	2			3	2								2		2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

DSP Preliminaries

Sampling of analog signals, concept of frequency in CT and DT sinusoids, mapping between analog frequencies to digital frequency, analytical treatment with examples, sampling theorem in time domain and its frequency domain implication (concept only), basic elements of DSP, advantages of digital over analog signal processing, applications of DSP, representation of discrete systems using difference equations, concept of non-recursive and recursive systems

Frequency Analysis of Discrete Time Signals

Discrete time Fourier transform: definition and convergence conditions, energy density spectrum of aperiodic signals, properties of DTFT, concept of frequency domain sampling, DFT, IDFT, properties of DFT, use of DFT in linear filtering, divide and conquer approach for efficient computation of DFT using Radix-2 FFT algorithms (DITFFT and DIFFFT)

Z-Transform and its application to LTI system analysis

Need for Z-transform, definition, relation between Z transform and DTFT, concept and properties of RoC, properties of Z transform, rational Z transform: pole locations and time domain behavior, causality and stability considerations for LTI systems; Inverse Z transform: power series method, partial fraction expansion method, unilateral Z transform and its application to solution of difference equations

FIR filters

Introduction to digital filters: Definition, types (FIR and IIR), choice between FIR and IIR filters, frequency response of ideal and practical filters; FIR filters: linear phase response and its implications, types of linear phase FIR filters, design of FIR filters using rectangular window, limitations of rectangular window, other important window functions: triangular, Hanning, Hamming, Blackman and their comparison, frequency sampling method of FIR filter design

IIR filters and filter realization

IIR filters: Frequency response of analog and digital IIR filters, concept of analog filter design, design of IIR filters from analog filters: IIR filter design by impulse invariance method, Bilinear transformation method, warping effect, IIR filter design using Butterworth approximation, characteristics of Butterworth, Chebyshev and elliptical filters, frequency transformations in analog and digital domain, filter realization using direct form, cascade form and parallel form, finite word length effects in design of FIR and IIR filters

Digital Signal Processor

Introduction, special features of digital signal processors, selection criteria for digital signal processor, functional block diagram and important architectural features of TMS320C67xx

Text Books

1. Digital Signal Processing: Principles, algorithms and applications, J. G. Proakis, D.G. Manolakis, 4th edition, Pearson Prentice Hall, 2007
2. Fundamentals of Digital Signal Processing, Lonnie C Ludeman, 1st edition, Wiley India Pvt. Ltd., 2009

Reference Books

1. Digital Signal processing: Practical approach, Ifaeachor E.C, Jervis B. W., 2nd edition, Pearson Education, 2012
2. Digital Signal Processing, S. Apte, 2nd edition, Wiley India Publication, 2009
3. Digital Signal Processing: Fundamentals and applications, Li Tan, Jean Jiang, 2nd edition, Academic press, 2013
4. Digital Signal Processing, A. Nagoor Kani,2nd edition, McGraw Hill Education, 2012

ET306UX ELECTRONICS INSTRUMENTS AND APPLICATIONS

Teaching Scheme : 03L + 00 T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA+ 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course is designed to lay the foundation for further studies of the various measuring instruments. It includes analog and digital instruments, generators, analyzers, oscilloscopes and data acquisition system. This course will explore the handling skills of electronic measuring instruments.

DESIRABLE AWARENESS/SKILLS

Knowledge of component, devices and instrumentation

COURSE OBJECTIVES

The objectives of offering this course are to

1. make strong fundamental of electronic instrument
2. strengthen ability of measurement by using different instruments
3. make familiar with applications of electronic measuring instruments

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. demonstrate the concepts of measurement
2. measure the various parameters with the help of digital storage and cathode ray oscilloscope
3. analyze the spectral purity of multiplexed signals
4. develop systems for process parameter control
5. paraphrase use of various analyzer

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	3	1	1								3		
2	2	3	2	1	1								3		
3	2	3	2	1	1								3		
4	2	3	2	1	1								3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Instruments for Basic Parameter Measurement

Introduction, amplified dc voltage and current meters, ac voltmeter using rectifiers, true RMS responding voltmeter, component measuring instruments, Q meter, RF power and

voltage measurement, digital phase meter, digital tachometer; transducers: thermister, Linear Variable Differential Transducer (LVDT)

Oscilloscope

Block diagram of Cathode Ray Oscilloscope (CRO) with function, dual beams CRO, dual trace CRO, storage oscilloscope and digital read out oscilloscope, amplitude, frequency, phase measurement with CRO, Digital Storage Oscilloscope (DSO)

Signal Generators and Analyzer

Generators: Introduction, function generator, frequency divider, signal generator modulation, pulse, square wave generator, audio frequency signal generation; Analyzer: introduction, wave analyzers, basic wave, frequency selective wave, spectrum analyzer, optical time-domain reflectometer

Data Acquisition, Conversion and Transmission

Introduction, objective of data acquisition system, digital transducer, data transmission systems, advantages and disadvantages of digital over analog transmitter, data logger

Digital Instruments

Digital multimeter, frequency meter, measurement of time, universal counter, decade counter, pH meter

Text books

1. Electronics Instrumentation and Measurement Techniques, W. D. Cooper and A. D. Helfrick, 3rdedition, Pearson Education, 2014
2. Elements of Electronic Instrumentation and Measurement, Joseph J. Carr, 4thedition, Pearson education, 2011

Reference Books

1. A course in Electrical and Electronics Measurements and Instrumentation, A. K. Sawhney, 19thedition, Dhanpat Rai and Sons, 2014
2. Electronic Instrumentation, H. S. Kalsi, 3rd edition, Tata McGraw Hill, 2012

ET306UY ELECTRONICS APPLIANCES

Teaching Scheme : 03L+00T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA + 30MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3Hrs

COURSE DESCRIPTION

This course aims to study the basic principles of electronics appliances and their applications in day to day life. This course explores knowledge of electronic appliances to the different field. Course contains basic, measuring, security and other appliances

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic electronics

COURSE OBJECTIVES

The objectives of offering this course are to

1. motivate individual interest in electronic system
2. specify operation of different appliances
3. describes various technique concepts

COURSE OUTCOMES

On successful completion of this course; student shall be able to

1. describe basic household appliances
2. acquire knowledge about operation and principle of electronic appliances
3. specify use of appliances in different application
4. handle electronic appliances

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2		1	2		1	2	2				2	1	
2	3	2		1	2				2				2	1	
3	3	3		1	2				1				2	1	
4	3	1			2				1				2	1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Basic Home Appliances

Microwave oven, washing machine, refrigeration system: domestic refrigeration-operating principle, block diagram, features; set of box: interoperable set of box, middle wave for set of boxes; Air-conditioner: components, types

Digital Appliances

Diaries, calculator, and digital clock, cellular phone: operating principle, block diagram, features; in-car computers: electronic ignition locks system, Antilock Breaking System

(ABS), Electronic control suspension, instrument panel display

Security Appliances

Remote control, security system, camcorder: operating principle/ block diagram, features; Automated Teller Machine (ATMS) card: electronic fund transfer, point of cell terminal and automated teller machine; barcodes scanner and decoder

Measuring Appliances

Thermometer, blood pressure meter, tachometer, electronic weighing machine-operating principle/ block diagram, features

Other Appliances

Facsimile (FAX): operation, block diagram, features; photography: process, extension to dynamic copier, musical instrument, video games- operation, block diagram, features

Text Books

1. Consumer Electronics, S. P. Bali, 3rd edition, Pearson Publication, 2008
2. Consumer Electronics,B.R. Gupta, V. Singha, 5thedition, S. K. Kataria and Sons Publication, 2006

Reference books

Catalogs

1. MCDOC03188052_Bosch_FS_2019_E-CAT_LR.pdf
2. MCDOC03188050_Bosch_BI_2019_E-CAT_LR.pdf

ET307U ELECTRONIC MEASUREMENTS AND MAINTENANCE LAB

Teaching Scheme : 01L, 02P; Total: 03 **Credits** : 02
Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50
ESE Duration : 3Hrs

COURSE DESCRIPTION

This course is designed to provide the practical exposure to electronic components, devices and instruments. In addition, it deals with measurements using electronic instruments and maintenance, etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course electronic material and components

COURSE OBJECTIVES

The objectives of this course are to

1. make familiar with various measuring instruments
2. handle electronic instruments

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. measure different parameter using various measuring instruments
2. handle electronic instruments
3. operate various analyzer
4. detect various losses using optical time domain reflectometer

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	2	3	2	2										1
2		2	3	2	2										3
3			3	3	3										2
4			2	2	2										1

Minimum ten experiments shall be performed. The list given below is just a guideline.

List of Experiments

- LCR-Q meter
- True RMS meter / digital multimeter
- Cathode ray oscilloscope
- Digital storage oscilloscope
- Frequency counter
- Digital phase meter
- Digital tachometer

- Function generator
- Harmonic distortion analyzer
- Spectrum analyzer
- Optical time domain reflectometer
- DATA logger

Note

- **ICA –**It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE** – It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET308U MICROPROCESSORS AND MICROCONTROLLERS LAB

Teaching Scheme : 02P; Total: 02 **Credits** : 01
Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course provides hands on designing and programming with 8086, 8051. The laboratory exercises are designed to give ability of machine, assembly and C- programming with 8086 and 8051.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET302U Microprocessor and Microcontrollers

COURSE OBJECTIVES

The objectives of offering this course are to

1. perform machine / assembly language programs with 8/16 bit processor-controller
2. timer, I/O , memory interface with programming
3. develop applications in electronic measurement, power control and instrumentation

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. implement machine / assembly language programs with 8/16 bit processor-controller
2. design timer, I/O , memory interface with programming
3. develop applications in electronic measurement, power control and instrumentation

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	3	2	1								1		
2	1	3	3	2	1									2	
3	1	3	3	2	1									2	

Minimum ten experiments shall be performed to cover entire curriculum of course ET302U. The list given below is just a guideline.

List of Experiments

- Simple manipulations
- Array manipulation
- Timer, serial port, interrupt programming
- Analog to digital converter interface and programming
- Digital to analog converter interface and programming
- Stepper motor, relay interface and programming
- LCD interface and programming

- Keyboard / display interface programming
- LEDs: Segment / dot matrix interface and programming
- CRT / Hard disc interface
- Flash programming

Note

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET309U DIGITAL COMMUNICATION LAB

Teaching Scheme	**:** 02P; Total: 02	**Credits**	**:** 01
Evaluation Scheme	**:** 25 ICA + 25 ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3 Hours		

COURSE DESCRIPTION

This course will impart the knowledge about implementation of various modulation and demodulation schemes of digital communication, which they learn in the theory course on Digital Communication. In this lab course, emphasis is given on implementation of baseband and band pass pulse modulation schemes. The course also introduces the implementation and / or simulation of spread spectrum modulation schemes. The course is designed to lay the foundation for further studies in the domain of implementation of advanced communication systems.

DESIRABLE AWARENESS/SKILLS

Knowledge of analog communication lab, awareness / skills of MATLAB and simulation

COURSE OBJECTIVES

The objectives of offering this course are to

1. impart the knowledge of lab work based on principles of various baseband and band pass modulation schemes.
2. develop the ability to implement in hardware / software various modulation schemes used for digital communication.
3. enable the students to demonstrate the knowledge of hardware / simulation based implementation of spread spectrum modulation schemes.

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. demonstrate the knowledge of implementation of basic building blocks of digital communication systems.
2. implement the digital baseband modulation schemes namely PCM, DPCM, DM and ADM.
3. implement the digital band pass modulation schemes namely FSK, PSK, QPSK, QAM etc.
4. demonstrate the practical knowledge of spread spectrum modulation schemes.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	2	3	3							2	3	2	2
2	2	2	2	3	3								3	2	3
3	1	2	2	3	3								2	2	2
4	1	2	2	3	3								3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum eight experiments shall be performed so as to cover entire curriculum of course ET303U**.** Experiments may be performed using hardware set-up or using software/simulator, as per the availability. The list given below is just a guideline.

List of Experiments

- Various formats of line codes
- Amplitude Shift Keying (ASK)
- Frequency Shift Keying (FSK)
- Binary Phase Shift Keying (BPSK)
- Differential Phase Shift Keying (DPSK)
- Quadrature Phase Shift Keying (QPSK)
- Quadrature Amplitude Modulation (QAM)
- Scrambler and Un-scrambler
- Direct Sequence Spread Spectrum (DS-SS)
- Frequency Hopping Spread Spectrum (FHSS)

Note

- **ICA –**Internal Continuous Assessment (ICA) shall support for regular performance of practical and its regular assessment. In addition, it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10)**.**

- **ESE –** End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET310U DATA STRUCTURES LAB

Teaching Scheme : 02P Total: 02 **Credit** : 01
Evaluation Scheme : 25 ICA+25 ESE **Total Marks** : 50
ESE Duration : 3Hrs

COURSE DESCRIPTION

The course provides an introduction to the theory, practice and methods of data structures and algorithm design. The course covers elementary data structures such as stacks, queues, linked lists, and trees in C language, and the algorithms designed for manipulating these data structures.

DESIRABLE AWARENESS/SKILLS

Knowledge of Computer Fundamentals and C Programming

COURSE OBJECTIVES

The objectives of offering this course are to

1. introduce to data structures and algorithm design
2. make students able to implement programs using variety of data structures

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. choose the data structures that effectively model the information in a problem
2. judge efficiency trade-offs among alternative data structure implementations or combinations
3. apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures
4. implement and know when to apply standard algorithms for searching and sorting
5. design, implement, test, and debug programs using a variety of data structures including lists, stacks, queues, binary tree structures, search trees, graphs

RELEVANCE OF PROGRAM OUTCOMES (POS) AND STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	2	2	2										1
2	2	2	2	2	2										1
3	2	2	2	2	2										1
4	1	1	1	2	2										1
5	3	3	3	2	2										1

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Minimum ten experiments shall be performed to cover entire curriculum of the course ET304U. The list given below is just a guideline.

List of Experiments

- Set operations like union, intersection and difference
- Searching methods-linear and binary
- Sorting methods-bubble, selection / insertion with complexity analysis
- Quick sort / merge sort with complexity analysis
- Data base management using array of structure with operations: create, display, modify, append, search and sort
- Polynomial addition using array of structure / linked list
- Singly linked list with operations create, insert, delete, and search
- Stack using arrays or linked lists
- Queue using array or linked lists
- Conversion of infix expression to postfix expression
- Circular queue operations

Note

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET 311U DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme : 02P Total: 02 **Credit** : 01
Evaluation Scheme : 50ICA **Total Marks** : 50

COURSE DESCRIPTION

In this course, the student will acquire hands-on experience with programming in any simulation tool like Scilab or MATLAB. Scilab or MATLAB will enable student to understand and validate the theory behind digital signal processing. The course covers experiments on sampling theorem, discrete Fourier transform, Z-transform, and digital filters.

DESIRABLE AWARENESS/SKILLS

Fundamentals of the course digital signal processing and MATLAB/Scilab programming.

COURSE OBJECTIVES

The objectives of offering this course are to

1. make strong foundation of discrete time signals and discrete systems
2. strengthen ability of students to analyze discrete time signals and discrete time linear time invariant (DTLTI) systems in time domain and frequency domain
3. make students familiar with design of digital filters and its implementation on DSP processor

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. analyze discrete systems in time domain
2. analyze discrete signals and DTLTI systems in frequency domain using DFT and Z transform
3. design FIR / IIR filters and implement on MATLAB/Scilab platform
4. implement FIR / IIR filters on digital signal processor

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2										3	1	
2	2	2	3	2	3								3	2	
3	3		3	2									3	3	
4	2			3	2								2		2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed to cover entire curriculum of course ET305U using simulation software like MATLAB/Scilab/Octave/C. The list given below is just a guideline.

List of Experiments

- Sampling theorem
- Convolution sum /correlation
- Discrete Fourier transform and its properties
- Pole zero plot of a transfer function
- To solve the difference equation and find the system response using Z transform (for non-relaxed LTI system).
- FIR filter using window and frequency sampling method
- IIR filter (Butterworth and Chebyshev Approximation)
- Effect of coefficient quantization on the impulse response of the filter using direct form I and II realization and cascade realization(theory assignment)
- Interfacing DSP processor
- FIR filter on DSP processor
- IIR filter on DSP processor

Note

- **ICA –**Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

ET452U AUDIO VIDEO ENGINEERING

Teaching Scheme	**:** 03L+ 00T; Total: 03	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to explore fundamental principles and practical aspects of audio and video engineering. The course covers basic concept of sound recording and reproduction, monochrome and color television. It provides comprehensive coverage of advanced Television (TV) system, different advanced broadcasting systems and connectivity in telecommunication networks by using switching systems.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic concepts of analog and digital communication

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide strong understanding of the fundamental principles and practical applications of audio and video engineering with latest updates
2. learn and understand the working of real life video system and the different elements of video system with encoding/decoding techniques
3. implement fundamentals of Audio systems and basics Acoustics
4. learn switching in telephony

COURSE OUTCOMES

On the successful completion of this course; student shall be able

1. understand the concept of basic television signal processing and telecommunication switching systems
2. identify globally accepted color TV standards
3. demonstrate the need of audio and video compression techniques in real life
4. acquire knowledge of latest digital TV systems and applications
5. describe the attributes of acoustics, sound engineering and storage media
6. use the latest techniques, skills, and modern tools necessary for engineering practices

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2										3	1	
2	2	2	3	2	3								3	2	
3	3		3	2									3	3	
4	2			3	2								2		2
5	3		3	2									3	3	
6	2			3	2								2		2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Methods of Sound Recording and Reproduction

Introduction to disc recording, magnetic recording, optical recording: CD and DVD, monophony, stereophony, High Fidelity (Hi-Fi) system; Public Addressing (PA) system: Basics of acoustics, block diagram, requirement, characteristics, its planning for various uses; Introduction to blue ray disc format

Basic Concept of Television

Scanning methods, horizontal and vertical synchronization, introduction to camera tubes, aspect ratio, Kell factor, horizontal and vertical resolution, video bandwidth, positive and negative modulation, composite video signal, television transmission: VSB transmission, TV channels, standard, channels bands, basic block diagram of monochrome TV receiver

Color Television Receiver

Color fundamental, compatibility, frequency interleaving, color mixing, color camera tube, color purity, concept of color picture tubes-static and dynamic convergence, encoder, decoder and color different signals comparison, different system concepts: Phase Altering Line (PAL), Sequential Color with Memory (SECAM), National Television Systems Committee (NTSC) system, color TV transmitter and receiver block diagram

Advanced TV Systems and Techniques

Introduction to digital compression techniques, JPEG, MPEG techniques, block diagram of digital TV-transmitter and receiver, advanced displays: plasma, LCD, LED, organic LED, introduction to high-definition TV (HDTV) transmitter and receiver

Advanced Broadcasting Systems

Introduction to digital cable TV, Conditional Access System (CAS), Direct to Home (DTH) system, video on demand, introduction to 3D Digital Terrestrial TV (DTV) system, study of Closed Circuit TV (CCTV) and DTV, introduction to Internet Protocol (IPTV) and mobile TV

Telephony

Introduction to fax, videophone, satphone, video conferencing, electronic space division switching-stored program control, centralized SPC, distributed SPC

Text Books

1. TV and video Engineering, A. M. Dhake, 2nd edition, McGraw Hill, 2007
2. Modern Television Practice, R. R. Gulati, 2nd edition, McGraw Hill, 2002
3. Audio and Video Systems, R. G .Gupta, 2nd edition, McGraw Hill, 2010
4. Telecommunication Switching Systems and Networks, Thiagarajan Viswanathan, 36th printing, PHI Learning Private Limited, 2012

Reference Books

1. Television Engineering and Video Systems, R.G.Gupta, 2nd edition, McGraw Hill, 2nd edition, 2012 and video Engineering, A. M. Dhake, McGraw Hill, 2nd edition, 2007
2. Basics Television and Video Systems, Bernard Grob, 5th edition, McGraw Hill,1998

ET456U AUDIO VIDEO ENGINEERING LAB

Teaching Scheme : 02P Total: 02 **Credit** : 01
Evaluation Scheme : 25ICA + 25ESE **Total Marks** : 50

COURSE DESCRIPTION

This course is designed to explore fundamental principles and practical aspects of audio and video engineering. The course covers basic concept of sound recording and reproduction, monochrome and color television. It provides comprehensive coverage of advanced Television (TV) system, different advanced broadcasting systems and connectivity in telecommunication networks by using switching systems.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic concepts of analog and digital communication

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a strong understanding of the fundamental principles and practical applications of audio and video engineering with latest updates
2. learn and understand the working of real life video system and the different elements of video system with encoding/decoding techniques
3. implement fundamentals of Audio systems and basics Acoustics
4. learn switching in telephony

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. understand the concept of basic television signal processing and telecommunication switching systems
2. identify globally accepted color TV standards
3. demonstrate the need of audio and video compression techniques in real life
4. acquire knowledge of latest digital TV systems and applications
5. describe the attributes of acoustics, sound engineering and storage media, use the latest techniques, skills, and modern tools necessary for engineering practices

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2											3		1
2	2	3	3		2								1	3	
3	3		3	1		3	1						3		3
4	3	1	1	3	3			1					3	1	2
5	1	1	1		2	1		3					3		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum twelve experiments shall be performed to cover entire curriculum of course ET452U. The list given below is just a guideline.

List of Experiments

- Color TV receiver
- Voltage and waveform analysis for color TV
- Alignment and fault finding of color TV using pattern generator
- HDTV
- Digital TV
- Visit to TV transmitter/Studio
- DTH and set top box
- CD/DVD players
- PA system with cordless microphone
- FAX
- Visit to telephone exchange

Note

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

SH376U HUMAN RESOURCES AND ENGINEERING ECONOMICS

Teaching Scheme: 02L **Credits :** 02
Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE **Total marks :** 100

COURSE DESCRIPTION

The course is intended to provide basic understanding of Economics and Human Resource to engineering students with the basic concept of economics and market structures. This course introduces the student to the fundamental concepts of Human Resource Management (HRM); the basic roles, competency, functions of HRM and basic knowledge of international HRM. Students will study the demand and supply relations. Students will learn nature of economic analysis, economic systems, wants, consumption and marginal utility.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic human skills and organizational behavior

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand the fundamentals of human resource and HR planning
2. know the different aspects of training and development
3. develop the analytical and rational ability with the study of economics
4. create awareness regarding current trends in human resource management
5. understand the standards and norms of human resource management.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. know the basic concept of human resource and HR planning.
2. able to demonstrate the ability to govern the functioning of a firm/organization under different market conditions.
3. understand and implement the fundamental concepts engineering economics.
4. understand the existing and emerging trends in international HRM followed globally
5. analyze the demand and supply of market economy.

CONTENT

Human Resources Management and HR Planning

Definition and meaning, functions, role of HR manager, duties and responsibilities of HR manager, human resource planning: concept, need, characteristic and benefits of HRP, factors affecting HRP, process of human resource planning, methods of HR forecasting, requirements of effective HRP, barriers to HRP, recruitment: concept, purpose and factors affecting recruitment, sources of recruitment, process of recruitment, selection tests, selection: concept selection process, barriers of selection, placement: concept and problems, induction/orientation; concept, objective types and steps in orientation, topics of induction programme, promotion, demotion, transfer, layoff, golden handshake, retirement/

separation, kinds of retirement, resignation, discharge, dismissal, suspension

Training and Development

Meaning, need and objective of training, difference between training and development, methods of training: On the Job and Off the Job, definitions, objective and process of performance appraisal

Current Trends in Human Resource Management

Downsizing, HR outsourcing, employee leasing, organizational culture, headhunting, 360 degree feedback, competency mapping, emotional intelligence, flexi-time and flexi-work, work life balance, employee stock ownership plan, CTC, VTC

Introduction to Engineering Economics

Concept of engineering economics, definition and scope of engineering economics, elements of costs, other costs/revenues: marginal cost, marginal revenue, sunk cost, opportunity cost, break-even analysis, profit/volume ratio (PIV Ratio), pricing under various market conditions: perfect competition - equilibrium of firm and industry under perfect competition, monopoly - price determination under monopoly, monopolistic competition - non-price competition, duopoly and oligopoly - meaning and characteristics

Wants and Consumption and Marginal Utility

Factors influencing wants, classification of wants, scale of preferences, consumption, standard of living, concept of utility, the law of diminishing marginal utility, demand, law of demand, determinants of demand, law of supply, determinants of supply, national income; meaning, stock and flow concept, NI at market price, NI at factor costs, GNP, GDP, NNP, NDP, personal income, disposal income

Text books

1. Principles of economics, D.M. Mithani, 11th edition, Himalaya Publishing, 2013
2. Essentials of Human Resource Management and IR, P. Subbarao, 3rd edition, Himalaya Publishing, 2010
3. Fundamental of Business Economics, D.M. Mithani and G.K. Murthy, 18th edition, Himalaya Publishing, 2013
4. India Economy, Gaurav Dutt and Ashwani Mahajan, 6th edition, S. Chand, 2013

Reference Books

1. Strategic Human Resource Management, Charles R. Greer, 2nd edition, Pearson Publication, 2000
2. International Human Resource Management, P. L. Rao, 1st edition, Excel Books, 2008
3. Economic Environment of Business: S.K. Misra and V.K. Puri, 2nd edition, Himalaya Publishing, 2000
4. Modern Economic Theory, Dr. K. K. Dewettand M. H. Navalur, 23rd edition, S. Chand, 2014
5. Economics: Principles and Applications, Mankiw, 5th edition, Cengage Learning, 2008

ET351 ELECTROMAGNETICS AND FIELDS

Teaching Scheme : 03L+ 00T Total: 03 **Credit** : 03
Evaluation Scheme : 10 ISA + 30MSE+60ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course is designed to lay the foundation for studies in areas such as microwave communication, antenna and wave propagation etc. This will explore the basic concepts of electromagnetic fields and vector algebra. This will allow learning and understanding Cartesian, cylindrical and spherical coordinate systems. They will learn to visualize in a three dimensional coordinate system. In this course, more emphasis is given on understanding basics, visualizing the system and solving a large number of numerical problems.

DESIRABLE AWAªENESS/SKILLS

Knowledge of basic mathematics, vector algebra, visualization skills, and an aptitude to solve problems

COURSE OBJECTIVES

The objectives of offering this course are to

1. make strong foundation of electromagnetic engineering and microwave communication
2. strengthen ability of students to visualize a system in three dimensions and develop a problem solving attitude
3. make students familiar with concepts and applications of electromagnetic engineering

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. understand the basics of electromagnetic fields and be able to apply these basics in a variety of applications
2. develop visualization along three axes and develop thinking capability
3. develop the skill of understanding hidden messages in any mathematical equation
4. understand different laws such as faraday's law, biot –savart law, understand Maxwell's equations and apply all these to solve problems

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	2	3	2	3	3				3		
2	3	2	2	2	2								3		
3	3	2	2	2	2								3		
4	3	2	2	2	2								3		
5	1	3	2	2	2								3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

CONTENT

Vector Calculus, Electrostatics and Transmission Lines

Coordinate system, transformations of coordinate systems, coulomb's law, electric field intensity, field due to a continuous volume charge distribution, field of a line charge, field of a sheet of charge and volume charge densities, electric flux density, gauss's law and divergence theorem, work done, potential and potential gradient, dipole and its electric field, dipole moment, energy density in electrostatic field, introduction to transmission lines, concept of distributed elements, equations of voltage and current, standing waves and impedance transformation, applications of transmission lines, introduction to smith chart

Conductor, Dielectrics and Capacitance

Current and current density, current continuity equation, properties of conductors, boundary conditions, boundary conditions for perfect dielectric materials, capacitance, capacitance of a two wire line, Poisson's and Laplace's equations

Magneto Statics

Biot – Savart's law and its vector form, magnetic field due to infinitely long current carrying conductor, ampere's circuital law, curl, Stoke's theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potential, faraday's law, Maxwell's equations(in point form and integral form), uniform plane waves, representation of wave motion in free space, perfect dielectrics and lossy dielectrics(wave equations), Poynting theorem and power density, propagation in good conductor: skin effect, reflection of uniform plane waves, standing wave ratio

Waveguides and Antennas

Parallel plane waveguide: Transverse Electric (TE) mode, Transverse Magnetic (TM) mode, cut off frequency, phase velocity and dispersion, Transverse Electromagnetic (TEM) mode, analysis of waveguide: general approach, rectangular waveguides, modes in rectangular waveguides, boundary conditions; Radiation resistance, radiation pattern, calculation of radiation resistance for short dipole, short monopole, half wave dipole and quarter wave monopole antennas, directivity, reciprocity between transmitting and receiving antennas, Hertzian dipole, near field far field, total power radiated by hertz dipole, folded dipole antenna, Yagi-uda antenna

Text Books

1. Engineering Electromagnetics, W. H. Hayt Jr and J. A. Buck, 7th edition, Tata McGraw-Hill, 2006
2. Antenna and Wave Propagation, K. D. Prasad, Satya Prakashan, 3rd edition, Tech Publications, 2001
3. Microwave Devices and Circuits, S. Y. Liao, 3rd edition, Prentice Hall of India, 1996
4. Electromagnetism problem with solutions, Ashutosh Pramanik, 3rd edition, Prentice Hall of India, 2012

Reference Books

1. Engineering Electromagnetics, Nathan Ida, 3rd edition, Springer, 2015
2. Engineering Electromagnetics, N. Rao, 6th edition, Prentice Hall, 2004
3. Foundations for Microwave Engineering, R.E. Collin, 2nd edition, Tata McGraw-Hill Publication, 1992

ET352U COMPUTER ARCHITECTURES

Teaching Scheme : 02L+ 00T; Total: 03 **Credit** : 03
Evaluation Scheme : 10 ISA + 30MSE +60ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course introduces to parallel processing and pipeline processing, vector and array processors architecture. The course will also cover multithreaded and multiprocessor architectures of computer.

DESIRABLE AWARENESS/SKILLS

Knowledge of digital electronics, microprocessors and computer programming

COURSE OBJECTIVES

The objectives of offering this course are to

1. make students to aware of parallel processing, pipeline architectures of computers
2. impart knowledge of vector processing and multithreaded architectures

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. paraphrase/ understand principles of pipelining
2. illustrate pipelining hazards and its resolving techniques
3. discuss basic vector architecture and issues in vector processing
4. describe high frequency performance of transistor
5. analyze inter processor communication network, time shared bus, crossbar switch, multiport memory model, memory contention and arbitration techniques

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	2								3		
2	3	2	2	2	2								3		
3	3	2	2	2	2								3		
4	3	2	2	2	2								3		
5	1	3	2	2	2								3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Overview of Parallel Processing and Pipelining Processing

Architectural classification, applications of parallel processing, instruction level parallelism and thread level parallelism, Explicitly Parallel Instruction Computing (EPIC) architecture, case study of Intel Itanium Processor (IA64), performance analysis

Pipeline Architecture

Principles and implementation of pipelining, classification of pipelining processors, general pipelining reservation table, design aspect of arithmetic and instruction pipelining, pipelining hazards and resolving techniques, data buffering techniques, job sequencing and collision, advanced pipelining techniques, loop unrolling techniques, out of order execution, software scheduling, trace scheduling, predicated execution, speculative loading, register stack engine, software pipelining, Very Long Instruction Word (VLIW) processor; Case study: superscalar architecture- Pentium

Vector and Array Processor

Basic vector architecture, issues in vector processing, vector performance modeling, vectorizers and optimizers; Case study: cray architecture SIMD computer organization masking and data network mechanism, inter PE communication, interconnection networks of SIMD, static Vs dynamic network, cube hyper cube and mesh interconnection network

Parallel Algorithms for Array Processors

Matrix multiplication, sorting, FFT multiprocessor architecture loosely and tightly coupled multiprocessors, processor characteristics of multiprocessors, inter processor communication network, time shared bus, crossbar switch, multiport memory model, memory contention and arbitration techniques, cache coherency and bus snooping, Massively Parallel Processors (MPP), Cluster and Network of Work Stations (COW's and NOW's), Chip Multi Processing (CMP), case study of IBM Power4 Processor, inter processor communication and synchronization

Multithreaded Architecture

Multithreaded processors, latency hiding techniques, principles of multithreading, issues and solutions, parallel programming techniques: message passing program development, synchronous and asynchronous message passing, message passing parallel programming, shared memory programming, data parallel programming, parallel software issues

Text Books

1. Computer Architecture and Parallel Processing, K.I. Hwang, F. A. Briggs, McGraw-Hill
2. Advanced Computer Architecture, K. Hwang, Tata McGraw-Hill , 2001

Reference Books

1. Parallel Computers, V. Rajaraman, L Sivaram Murthy, Prentice Hall, 2004
2. Computer Organization and Architecture, Designing for Performance, W. Stallings, 6th edition, Prentice Hall, 2010
3. Scalable Parallel Computing, K. Hwang, McGraw-. Hill, 1998
4. High performance computer Architecture, H. Stone, Prentice Hall of India
5. Advanced Computer Architecture, R.Y. Kain , 1st edition, Amazon, 1995

ET353UA TELEMATICS

Teaching Scheme	**:** 03L+ 00T Total: 03	**Credit**	**:** 03
Evaluation Scheme	**:** 30MSE + 10 ISA +60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to explore fundamental principles of switching systems, practical aspects traffic engineering and basic concepts of wireless communication system. This course provides comprehensive coverage of GSM, advanced access techniques.

DESIRABLE AWARENESS/SKILLS

Knowledge of analog and digital communication

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a strong understanding of the fundamental principles and practical applications of switching system
2. understand the working of wireless communication system
3. explore fundamentals of digital cellular systems

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. understand the concept of basic telecommunication switching systems
2. provide knowledge of globally accepted GSM standards
3. demonstrate the need of wireless communication systems in real life
4. acquire knowledge of latest digital cellular systems and applications
5. paraphrase switching in IP telephony

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3												3	2	
2	3	2		2					1				2	3	
3	1	1	3			3							3	3	
4	3	3	2										3	2	
5		2										3		2	3

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Telephone switching and Traffic Engineering

Evolution of telecommunication, simple telephone communication, basics of switching systems: strowger switching system, crossbar switching system, dialling mechanism,

electronics switching, digital switching system, Stored Program Control (SPC) configuration, Architecture features, centralized and distributed SPC, enhanced services

Traffic Engineering

Introduction, network traffic load and parameters, traffic measurement unit, traffic distribution, grade of service, blocking probability

Wireless Communication System

Evolution of mobile radio, examples of wireless communication, paging, cordless telephone systems, Wireless Local Bluetooth and personal area Networks; Mobile cellular Telephony: limitations of conventional mobile telephone, frequency band allocation, cellular components, operations of a cellular system, calculation of maximum number of calls per hour per cell, frequency channels per cell, concept of frequency reuse, cell splitting: hand off mechanism: delayed, forced, cell site and inter system, co-channel interference reduction factor, fading, multi-user communication; Access techniques: Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA) and Code Division Multiple Access (CDMA)

Digital cellular systems

Global System for Mobile (GSM), radio aspects, features of GSM, architecture details, channel structure, security aspects, authentication and ciphering key; different call flow sequences in GSM, North American CDMA cellular standard, radio aspect, forward link and reverse link structure

IP telephony

Introduction to Voice Over Internet Protocol (VOIP), low level protocols (RTP / RTCP / UDP), voice activity detection and discontinuous transmissions; IP telephony protocols: H.323 standard, Session Initiation Protocol (SIP), gateway location protocol, quality of service (QOS) requirements, RSVP architecture, message format, reservation merging

Text Books

1. Telecommunication switching systems, Vishwanathan, 2nd edition, Prentice Hall of India, 2015
2. Wireless and cellular Telecommunications, William C.Y. LEE, McGraw Hill, 3rd edition

Reference Books

1. Wireless communication, Rappaport, Prentice Hall of India
2. Computer Networks, Andrew S Tanenbaum, 4th edition, Prentice Hall of / Pearson Education

ET353UB MODERN CONTROL THEORY

Teaching Scheme : 03L+ 00 T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE+ 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course is designed to lay the foundation for further studies in areas such as control, communication, signal processing and power electronics systems etc. This course will explore the basic concepts, state space, modelling of linear and nonlinear continuous, time variant system, controllability, observability, stability of system

DESIRABLE AWARENESS/SKILLS

Knowledge of basic mathematics, electrical and electronics engineering, control system engineering

COURSE OBJECTIVES

The objectives of offering this course are

1. learn and understand linear algebra for application in control system
2. to make a strong foundation of linear control systems using state space representation.
3. to introduce steps to analyze dynamics of a linear system by solving system model/equation or applying domain transformation.
4. explore the steps to analyze multivariable systems using concepts of controllability, observability and stability.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. learn basics of linear algebra for application in control system
2. modeling of linear control systems using state space representation.
3. analyze dynamics of a linear system by solving system model/equation or applying domain transformation.
4. realize multivariable systems using concepts of controllability, observability and stability.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2										1	1	
2	3	2	2	1	1								1	1	
3	3	3	3	2	2								1	1	
4	3	2	2	2	1								1	1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Mathematical Preliminaries

Linear vector spaces and linear operators: fields, vectors and vector spaces, linear dependence, dimension of linear space, the notion of bases, linear transformation and matrices, scalar product and norms, quadratic function and definite matrices, vector and matrix norms, Gram determinant; Solution of linear algebraic equation: range space, rank, null space and nullity of a matrix, homogeneous and non homogeneous equations, Eigen values and Eigen vectors and a canonical form representation of linear operators; Functions of square matrix: Caley Hamilton theorem.

State Variable Descriptions

Introduction, concept of state, stat equations for dynamic system, time invariance and linearity, non-uniqueness of state model, state diagram, linear continuous and discrete time models, nonlinear models, local linearization of nonlinear models

Solution of State Equation

Introduction, existence and uniqueness of solution to linear and nonlinear continuous time state equation, linear time varying and time invariant continuous time state equations, linear discrete time state equations, state equations of sampled data system

Observability and Controllability

Introduction, concept of controllability and observability, controllability and observability test for continuous time systems, controllability and observability of discrete time systems, controllability and observability of state model in Jordan Canonical form, loss of controllability and observability due to sampling, controllability and observability canonical forms of state model; Relationship between state variable and input-output descriptions: input-output maps from state models, output controllability, reducibility, state models from input-output maps

Stability

Introduction, equilibrium points, stability of linear time invariant system, stability of nonlinear continuous time autonomous systems, direct method of Lyapunov and linear continuous time autonomous system, Lyapunov functions to estimate transients, direct method of Lyapunov and discrete time autonomous system

Text Books

1. Modern Control Engineering, Katsuhiko Ogata, 5th edition, Prentice Hall of India, 2010
2. Modern Control System Theory, M. Gopal, New Age International Publishers, reprint 2015

Reference Books

1. Digital Control and State Variable Methods, M. Gopal, 4th edition, Tata McGraw Hill, 2012

2. Modern Control System, Richard C. Dorf, Robert H. Bishop,10th impression, Pearson, 2013

ET353UC CONSUMER ELECTRONICS

Teaching Scheme	**:** 03L+ 00T Total: 03	**Credit**	**:** 03
Evaluation Scheme	**:** 10 ISA +30MSE + 60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to explore fundamental principles and practical aspects of consumer electronic appliances. The course covers learning and understanding basic concept of sound and reproduction, monochrome and color television, advanced TV system like HDTV, digital TV and different advanced consumer appliances like fax, microwave oven, washing machine ,air conditioner , refrigerator and digital camera.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic understanding of electronic systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a strong understanding of the fundamental principles and practical applications of audio and video engineering with latest updates
2. learn and understand the working of real life video system and the different elements of video system with encoding/decoding techniques
3. implement fundamentals of Audio devices and systems
4. learn consumer appliances in daily life

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. understand the concept of basic television signal processing and telecommunication switching systems
2. identify globally accepted color TV standards
3. demonstrate the need of audio and video compression techniques in real life
4. acquire knowledge of latest digital TV systems and consumer applications
5. describe the attributes of acoustics, sound engineering and storage media; use the latest techniques, skills, and modern devices necessary for engineering practices

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1			1	1						2		
2	2	3			3		1							2	
3	1	2	3		2	2	3						3	2	3
4	2	3	2	2	3								3	2	
5	2	2	3										1	3	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Audio system

CD player, microphones, loud speakers, home theatre sound system digital tuning, ICs used in FM tuner, public address (PA) system: planning, characteristics, specification, DVD player

Television Receivers and Video Systems

Monochrome TV receiver, color TV receiver, Digital TVs: LCD, LED , PLASMA, HDTV, 3D TV, projection TV, DTH receiver , digital Video, digital video interface, introduction to digital compression techniques, JPEG, MPEG techniques

Home / Office Appliances

FAX and photocopier, microwave oven, controllers, instructions, technical specifications, washing machine, technical specifications, types of washing machine, fuzzy logic, air conditioner and refrigerators, components features, applications, and technical specification, digital camera and cam coder, field strength meter.

Biomedical Instruments

Grounding and safety, electrodes, choice of transducer for specific application, electrocardiograph, blood pressure measurement, body mass index, audiometer, and pacemaker

Text Books

1. TV and video Engineering, A. M. Dhake, 2nd edition, McGraw Hill, 2007
2. Modern Television Practise, R. R. Gulati, 2nd edition, McGraw Hill, 2002
3. Audio and Video Systems, R. G .Gupta, 2nd edition, McGraw Hill, 2010
4. Telecommunication Switching Systems and Networks, Thiagarajan Viswanathan, 36th printing, PHI Learning Private Limited, New Delhi, June 2012

Reference Books

1. Television Engineering and Video Systems, R. G. Gupta, 2nd edition, McGraw Hill, 2012
2. Basics Television and Video Systems, Bernard Grob, 5th Edition, McGraw Hill, 1998

ET354UA INFORMATION THEORY AND CODING TECHNIQUES

Teaching Scheme	**:** 02L + 00 T Total: 02	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA+ 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course will impart the basic concepts of information theory and coding techniques. In the course, emphasis is given on information theory, entropy, various source coding techniques for data compression and various channel coding techniques for error detection and correction.

DESIRABLE AWARENESS/SKILLS

Knowledge of digital communication, probability and fundamentals of communication systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. impart the knowledge of principles of information theory as applied for digital information sources
2. develop the ability to design source coding for the given information source
3. enable the students to demonstrate the knowledge of various channel coding schemes for error detection and correction

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. demonstrate the knowledge of information theory and entropy
2. design the source coding for the given information source using algorithms such as Shannon-Fano and Huffman coding
3. design the channel coding scheme for the given requirements using techniques of block, cyclic and convolution codes
4. select a suitable source and channel coding scheme for the given requirements

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	3	2							2	3	2	2
2	3	2	3	2	2								3	2	3
3	2	3	3	2	2								2	2	2
4	3	2	2	2	1								3	2	2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly Correlated**

COURSE CONTENT

Information Theory

Introduction to information theory, entropy and its properties, run length encoding, discrete memory less channel, mutual information

Source Coding

source coding theorem, Huffman coding, Shannon-Fano coding, audio and video compression standards

Linear Block Codes

Channel capacity, channel coding theorem, mutual information, information capacity theorem, linear block codes : matrix description, coding using generator matrix and parity check matrix

Cyclic Codes

Hamming codes, error detection and correction capability, parity check matrix, syndrome and error detection, cyclic codes : generation of code vectors in systematic and non-systematic form, generator matrix for cyclic codes, decoding of cyclic codes using syndrome vector

Convolution Codes

Convolution code : encoder, code tree, trellis and state diagram; decoding methods : Viterbi algorithm, distance bounds for convolution codes, calculation of free distance using transfer function

Text Books

1. Information Theory, Coding and Cryptography, Ranjan Bose, 2nd edition, McGraw Hill Publication, 2008
2. Modern Digital and Analog Communication, B.P. Lathi and Zhi Ding, 5th edition, Oxford University Press, 2018

Reference Books

1. Error Correction Coding, Todd K. Moon, Wiley India Edition, 2006
2. Introduction to Error Control Codes, Salvatore Gravano, 1st edition, Oxford University Press, 2007

ET354UB BIO-INFORMATICS

Teaching Scheme	**:** 02L+ 00T; Total: 02	**Credit**	**:** 02
Evaluation Scheme	**:** 10 ISA +30MSE + 60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course provides necessary background to understand the evolution and appreciate the field of cell biology and genetics. It includes introduction to the bio-informatics and computerized data searches, alignments and substitution patterns.

DESIRABLE AWARENESS/ SKILLS

Fundamentals of cell structure, basic molecular biology, mathematics and information technology

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand fundamental aspect of the course
2. converse about use, service and application of biomedical engineering
3. focus on methods and applications pertaining to genomics and proteomics

COURSE OUTCOMES

On successful completion of this course, student shall be able to

1. analyse classification interpretation and structure visualization of genomes and proteomes
2. demonstrate the knowledge of the modern health care system and role played by engineers
3. evaluate the application of bio-informatics in the field of medical diagnostics

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITHSTRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	1	1	1	1						3		
2	2	3	2	1	1	3	2								2
3	2	3	2	1	1	2	2		1	1	3	2		3	

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Cell, Molecular Biology and Genetics

Cell structure and properties of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), central dogma, gene expression, linkage, DNA sequencing, DNA replication signal transduction, prokaryotic and eukaryotic genomes, gene structure, genetic code (GC) content, gene density, open reading frames, gene expression, repetitive elements

Biological database: nucleotide, protein

Introduction to Bio-informatics

Definition and evolution, internet and bio-informatics, human genome project, genome data statistics, applications of bio-informatics

Data Searches, Pair-wise Alignments and Substitution Patterns

Dot plots, simple alignments, gaps, scoring matrices, Needleman and Wunsch algorithm, global and local alignments, database searches, pattern of substitution with genes, estimating substitution numbers, variations in evolutionary rates between genes, molecular clocks, organelles

Distance Based and Character Based Methods of Phylogenetics

Merits of phylogenetic, phylogenetic trees, distance matrix methods, maximum likelihood approaches, multiple sequence alignments, parsimony and strategies for faster searches, tree confidence and molecular phylogenies

Markov Chains and Applications

Machine learning methods, Hidden Markov Models (HMM), applications of HMM in gene identification and profiles HMMS, neural networks and support vector machines

Analysis Tools

Bioinformatics programming tool kit, proteome analysis through Liquid Chromatography–Mass Spectrometry (LC-MS), Nuclear Magnetic Resonance (NMR), microscopic image analysis, x-ray crystallographic analysis, and automated gel analysis, network pathway analysis and metabolomics software, facilities in bioconductor

Text Books

1. Bioinformatics: Concepts, Skills and Applications, S. C. Rastogi, N. P. Mendiratta, P. Rastogi, 2nd edition, CBS Publishers and Distributors, 2011
2. Introduction to Bioinformatics, A. M. Lesk, 3rd edition, Oxford University Press, 2009
3. Fundamentals of Bioinformatics and Computational Biology (Methods and Exercises on MATLAB), G. B. Singh, 6th volume, Springer International Publishing, Switzerland, 2015

Reference Books

1. Fundamental Concepts in Bioinformatics, D. E. Krane, M. L. Raymer, 1st edition, Pearson Education, 2003
2. Introduction to Bioinformatics, Pearson Education, K Attwood, D. J. parry-Smith, 1st edition (11th Reprint), 2005
3. Cell and Molecular Biology, G. Karp, 1st edition, John Wiley, 2010
4. Bioinformatics: The Machine Learning Approach, P. Baldi, S. Brunak, 2nd edition, MIT Press, 2001
5. Python Programming for Biology, Bioinformatics and Beyond, T. J. Stevens and W. Boucher, University of Cambridge, 2015

ET354UC EMBEDDED SYSTEMS

Teaching Scheme	**:** 02L+ 00T; Total: 02	**Credit**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30MSE + 60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course introduces to basics of embedded systems. The course will also cover principals of real time operating systems.

DESIRABLE AWARENESS/SKILLS

Knowledge of digital electronics, microprocessors and microcontrollers and c programming

COURSE OBJECTIVES

The objectives of offering this course are to

1. impart knowledge of embedded systems
2. learn basics of ARM processors
3. understand principles of real time operating system

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. paraphrase principles of embedded systems
2. illustrate pipelining hazards and its resolving techniques
3. demonstrate ARM peripheral interface and programming
4. describe real time operating systems working
5. perform case study on Linux/ MICRO-COSII

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	2								3		
2	3	2	2	2	2								3		
3	3	2	2	2	2								3		
4	3	2	2	2	2								3		
5	1	3	2	2	2								3		

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Embedded Systems

Introduction, definitions, design steps, technology: processor, IC, design technology, design productivity gap, custom single purpose processor design, RT level design, Finite State Machine with Datapath (FSMD), data paths, optimization, instruction set simulators for simple processors, state machine and concurrent process models, Hierarchical Concurrent Finite State Machines (HCFSM), program-state machine PSM

Embedded Processors

ARM7/9: Block diagram, architectural features, instruction types, instruction set, thumb instruction set, pipeline, its hazards, bus architecture, interrupts exceptions, basic peripherals, interfacing with analog world

Real-time Operating Systems

Introduction, structures, features, multitasking operating systems, scheduler algorithms, priority inversion, commercial operating systems, embedded software development tools, emulation and debugging techniques

Memory Management

Concepts of segmentation, virtual memory, management of virtual memory: demand paging performance of demand paging page replacement algorithms thrashing, file organization, concept of files and directories, hierarchical structure of file, space allocation, free space management. IO, file information management

Security Issues and Protection Mechanism

Goals of protection domain of protection access matrix implementation of access matrix revocation of access rights security problems authentication program threats, system threats, threat monitoring

Case-Study: Micro-COSII / Linux: Resource management**,** CPU, memory, device, Real time without RTOS.

Text Books

1. Embedded System Design, Raj Kamal, 2nd edition, Tata McGraw Hill, 2008
2. Computer organization and Design, D. A. Patterson and J. L. Hennessy ARM, 4th edition, Elsevier- Morgan Kaufmann, 2009
3. Embedded Systems Design, Steve Heath, 2nd edition, Elsevier, 2003
4. Introduction to Embedded Systems, K. V. Shibu , 2nd edition, Tata Mc Graw Hill, 2017

Recommended Books

1. ARM System Developer's Guide: Designing and Optimizing, N. Sloss, Symes and D. W. Chris, 1st edition, Morgan Kaufman Publication, 2004
2. Digital Signal Processors, B. Venkataramani and M. Bhaskar,2nd edition, Tata McGraw Hill, 2011
3. ARM System-on-Chip Architecture, S. Furber, 2nd edition, Pearson Education, 2001
4. Embedded System Design, F. Vahid and T. Givargis, Wiley, 2002
5. Technical references on www.arm.com

ET355UX MICROPROCESSOR TECHNIQUES

Teaching Scheme	**:** 03L+ 00 T; Total: 03	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE+ 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course is designed to lay the foundation for further studies in areas such as communication, signal processing and power electronics systems etc. This course will explore the basic concepts, architecture, organization, memory map, instruction set, interrupts of 8085 and interfacing with the peripheral devices.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic mathematics, electrical and electronics engineering, digital electronics fundamentals

COURSE OBJECTIVES

The objectives of offering this course are to

1. get acquainted with architecture of 8085
2. learn the addressing modes and instruction set of 8085 and concepts of assembly language programming
3. develop understanding of interrupt structure and serial I/O section
4. implement interfacing of different peripherals

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. paraphrase the architecture and memory organization of 8085 microprocessors
2. learn instruction set to write, comment, and debug programs in assembly language
3. apply interrupts for handshaking and data transfer protocols
4. interface I/O devices and memory to microprocessor

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1										1	1	
2	3	2	2	1	1								1	1	
3	3	2	2	1	1								1	1	
4	3	2	2	1	1								1	1	

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Overview of Microprocessor

Microprocessor Intel 8085: pin diagram, functional block diagram, architecture, organization of microprocessor based system, address and data bus; Memory Interfacing: classification of memories, memory map; introduction to architecture of Intel 8086

Programming

Intel 8085 instruction set, classification, addressing modes, data transfer operations, arithmetic and logic operations, branch operations, addition, subtraction, comparison assembly language programs

Interrupts

Intel 8085 interrupt and structure, instructions, stacks, subroutines, CALL and RET instructions, basic concepts in serial input-output

Peripheral Devices

Peripheral devices features, operating modes and working of 8255 programmable peripheral interface, ADC 0809 and DAC 0808; interfacing to LED, stepper motor, interdisciplinary application such as pH meter, AC/DC power factor measurement, digital strain meter, force-torque measurement

Text Books

1. Microprocessor Architecture, Programming and Applications, Ramesh Gaonkar, Wiley Eastern Publication
2. Fundamentals of Microprocessors And Microcomputers, B. Ram, Tata McGraw Hill Publication

Reference Books

1. Microprocessor And Programmed Logic, K. L. Short, 2nd edition, Pearson Education

ET355UY FUNDAMENTALS OF TELECOMMUNICATION

Teaching Scheme : 03L+ 00 T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course covers basics of telecommunication and various aspects of multiplexing, transmission medium, and signal. This course also introduces digital communication system and its application. This course gives basic information about network organization and switching system, measurement of traffic and unit of traffic.

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic communication system

COURSE OBJECTIVES

The objectives of offering this course are to

1. learn the basic terms and principles of signal processing in telecommunication
2. describe different transmission medium
3. explore term of digital communication and telecommunication concept

COURSE OUTCOMES

On successful completion of this course, student shall be able to

1. describe basic of telecommunication
2. classify methods of multiplexing
3. specify need of modulation and types
4. explore knowledge of long distance telephony and measurement of traffic

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1		1	2		1	2	1				2	1	1
2	3	1		1	2			2	1				2	1	1
3	3	1		1	2			2	1				2	1	1
4	3	1			2			2	1				2	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Basics of Communication

Representation of signal in Communication system and their terminologies, communication system: information, transmitter, channel noise, receiver, destination; Modulation: need of modulation, Amplitude Modulation (AM), Frequency Modulation(FM), Phase Modulation (PM); bandwidth requirement

Signals and Transmission

Signals in everyday life, electrical telegraph, frequency and phase, signal transmission: analog transmission, digital transmission, binary digital signals; transmission medium: wire pair, coaxial cable, fiber optic cable, radio transmission

Basic of Telecommunication

Concept**,** end-users, nodes, and connectivity; telephone numbering and routing, use of tandem switches in a local area**,** connectivity, introduction to the busy hour and grade of service , simplex, half-duplex, and full duplex **,** one-way and two-way circuits, network topologies, variations in traffic flow, quality of service

Digital Communication

Comparison of analog and digital signal, binary digital system, characteristic of data transmission system, data sets and interconnection requirement: modem classification, interconnection of data circuit to telephone loops, network organization and switching system

Broadband Communication System

Multiplexing: Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM); long haul system: submarine cable, satellite communication; elements of long distance telephony: routing codes and signaling system, telephone exchanges and routing; traffic engineering: measurement of traffic and unit, grade of service

Text Book

1. Principal of Communication System, Louis E. Frenzel Jr., 4th edition, McGrawHill publication, 2016

Reference Books

1. Electronic communication System, George Kennedy, 3rd edition, McGrawHill publication, 1988
2. Electronic Communication Systems, George Kennedy, Bernard Davis, SRM Prasanna, 5th edition, McGraw Hill publication, 2015
3. Fundamentals of Telecommunication, Roger L and Freeman, 2nd edition, Wiley Publication, 2005

SH377U PROFESSIONAL SKILLS AND ETHICS

Teaching Scheme	: 01 L+02 PR; Total 03	**Credit**	**:** 02
Evaluation Scheme	**:** 50 ICA	**Total marks**	**:** 50

COURSE DESCRIPTION

This course is mainly designed to inculcate professional skills among students community. It includes both soft skill development and ethics at work place. The student will learn the communication and presentation skills along with different skills. Student will study the organization of meeting, general etiquette and manners and organizational communication. This course will help to develop thinking ability, positive attitude, and leadership ability to perform well under varied circumstances.

DESIRABLE AWARENESS/SKILLS

Basic principles of communication and English as a language

COURSE OBJECTIVES

The objectives of offering this course are to

1. strengthen the persona of student
2. learn use of concepts and applications of ICT based presentation skills
3. sharpen the professional skills to enhance employability

COURSE OUTCOMES

On successful completion of this course; student shall be able to

1. apply basic knowledge of public communication and presentation skills
2. draft a document and write a technical meeting report
3. demonstrate good etiquette and manners in his/her life and face GD/PI confidently
4. use the human values and engineering ethics
5. understand the organizational human behavior

CONTENTS

Professional Skills

Communication and presentation skills: Elements of presentation- designing and delivering business presentations, advanced technological support for presentation, computer based power point presentation, display of etiquette and manners

Group Communication

Introduction - understanding group, types of groups; meetings- planning, objectives, participants, timing, venue of meetings; meeting documentation: notice, agenda, agenda notes, book of enclosures and resolution and minutes of meeting; group discussion, personal interviews

Leadership skills

Meaning, functions, ingredients and styles of leadership; leadership styles based on authority - managerial grid, leadership theories - trait theory, behavioral theories, path goal

theory, charismatic leadership theory, situational theories-Fiedler's model; transactional and transformation leadership

Interpersonal Skills

Introduction - Johari window, principles of changes in awareness, Ego state analysis of transactions, life script- life positions- stroking, psychological games, benefits of transactional analysis, problem solving and critical thinking skills, SWOT analysis

Ethics

Human Values: objectives, morals, values, ethics, integrity, work ethics, service learning, virtues, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, cooperation, commitment , empathy, self-confidence, challenges in the work place, spirituality

Engineering Ethics

Values, norms and beliefs, culture, cultural differences, Hofstede's dimensions of cultural differences, cultural discrimination, morality: moral norms, moral values, characteristics of moral standards, Kohlbergs's model of cognitive moral development, moral theories, concept of ethics, ethics and law business ethics: meaning, factors affecting business ethics, applied ethics, code of ethics vs code of conduct vs code of practice, whistle blowing, engineering council of india, codes of ethics for TATA group, ethics and codes of business conduct in MNC

Topics for Assignment /Practical

Minimum ten number of assignments/practical shall be performed to cover entire curriculum of the course. The list given below is just a guideline

1. Power point presentation on general topics/ latest trends/technical
2. SWOT analysis
3. Preparation of meeting documents and conducting a business meeting
4. Demonstration of general etiquette and manners through role playing
5. Role play on leadership skills
6. Writing application letter along with resume
7. Conducting group discussions
8. Mock personnel interview
9. Role play by using human skills
10. Case study on ethical issues faced by Indian industries
11. Role play on ethical behaviour

Text books

1. A Textbook on Professional Ethics and Human Values, R.S. Naagarazan, new age international, 2007
2. Professional Ethics and Human Values, M. Govindarajan, S. Natarajan, V. S. Senthilkumar, PHI Learning Private Limited, 2013
3. Human Values and Professional Ethics Paperback , A. Saxena Prof. S. Sharma, 2013

4. The Professional Skills Handbook for Engineers and Technical Professionals, Kevin Retz, Taylor and Francis Group, 2019
5. Business Skills for Engineers and Technologists, Harry Cather, Richard Morris, Joe Wilkinson, Elsevier, 2001
6. Organization Behavior, Suja R. Nair, Himalaya Publishing House Private, Limited, 2014

Reference Books

1. An Introduction to Ethics, John Deigh, 3rd edition, Cambridge university press, 2010
2. An Introduction to Ethics, William Lillie, Reprint 2003,Aallied Publishers privateLimited, 2003
3. The Dimensions of Ethics: An Introduction to Ethical Theory, Wilfrid J. Waluchow, First edition, Broadview press, 2003
4. Business Communication (BCOM), Lehman Sinha, 2nd edition, Cengage Learning, 2012
5. Organization Behavior, Stephen P. Robbins, 13th edition, Pearson Education, 2009

ET356UA TELEMATICS LAB

Teaching Scheme : 02P; Total: 02 **Credit** : 01
Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50

COURSE DESCRIPTION

This course is designed to explore fundamental principles of switching systems, practical aspects traffic engineering and basic concepts of wireless communication system. This course provides comprehensive coverage of GSM, advanced access techniques.

DESIRABLE AWARENESS/SKILLS

Knowledge of analog and digital communication

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a strong understanding of the fundamental principles and practical applications of switching system
2. understand the working of wireless communication system
3. explore fundamentals of digital cellular systems

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. identify and solve basic communication problems
2. apply advanced access techniques in communication system
3. analyse traffic problems in audio and video services
4. compare mobile communication system and existing wireless communication networks

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	3		1	3							3		
2	3	2	3	1	1									2	
3	1	3	3			2	1								3
4			2	2	1									2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum eight experiments shall be performed to cover entire curriculum of course ET353UA. The list given below is just a guideline.

List of Experiments

- Mobile trainer
- GSM trainer
- Visit to TV transmitter/Studio

- CD/DVD players
- PA system with cordless microphone
- FAX
- CDMA trainer
- EPABX

Note

- ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10)

- ESE – End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute

ET356UB MODERN CONTROL THEORY LAB

Teaching Scheme : 02P; Total: 02 **Credits** : 01

Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50

COURSE DESCRIPTION

This course is designed to provide practical exposure to electronic modern control system theory. It deals with the state space models, observability, controllability and stability of the system.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET353U Modern Control Theory

COURSE OBJECTIVES

The objectives of offering this course are to

1. learn and understand linear algebra for application in control system
2. make a strong foundation of linear control systems using state space representation
3. introduce steps to analyze dynamics of a linear system by solving system model/equation or applying domain transformation
4. explore the steps to analyze multivariable systems using concepts of controllability, observability and stability

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. learn basics of linear algebra for application in control system
2. modeling of linear control systems using state space representation
3. analyze dynamics of a linear system by solving system model/equation or applying domain transformation
4. realize multivariable systems using concepts of controllability, observability and stability

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1								**1**	**1**	
2	2	2	1	1	1								**1**	**1**	
3	2	2	3		1								**1**	**1**	
4	1	2	1	1	1								**1**	**1**	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed to cover the entire curriculum of course ET353UB. For simulation, MatLab, SciLab, python, etc. one of the available tools may be used. Following list of experiments is just a guideline

List of Experiments

- Matrices manipulations
- Transfer function of RLC circuits
- Transient response of first and second order system
- Representation of state model
- State model of a given transfer function and vice-versa
- State transition matrix of a given continuous time system
- Investigate controllability and observability of a given system
- Investigate the stability of continuous and discrete time systems using Lyapunov stability test
- State feedback gain matrix for pole placement
- Obtain the range of gain for the stability of the discrete time system
- Obtain impulse and step response of discrete time control systems
- Obtain the range of sampling time for the stability of discrete time system

Note

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by a student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET356UC CONSUMER ELECTRONICS LAB

Teaching Scheme : 02P; Total: 02 **Credits** : 01
Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50

COURSE DESCRIPTION

This course is designed to explore fundamental principles and practical aspects of consumer electronic appliances. The course covers learning and understanding basic concept of sound and reproduction, monochrome and color television, advanced TV system like HDTV, digital TV and different advanced consumer appliances like fax, microwave oven, washing machine ,air conditioner , refrigerator and digital camera.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic understanding of electronic systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a strong understanding of the fundamental principles and practical applications of audio and video engineering with latest updates
2. learn and understand the working of real life video system and the different elements of video system with encoding/decoding techniques
3. implement fundamentals of audio devices and systems
4. learn consumer appliances in daily life

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. test various consumer electronic appliances
2. troubleshoot different types of microphones and speakers
3. analyse the composite video signal used in T.V. transmission
4. maintain various consumer electronic appliances

RELEVANCE OF PROGRAM OUTCOMES (POS) AND STRENGTH OF CO RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2		1	2	3		2			1		3	3		
2	1	3			2	3							1	2	
3	2	3	2									1		3	
4	3	1	1	2	3		2					1			1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum eight experiments shall be performed to cover entire curriculum of course ET353UC. The list given below is just a guideline

List of Experiments

- Color TV receiver
- Voltage and waveform analysis for color TV
- Alignment and fault finding of color TV using pattern generator
- HDTV
- Digital TV
- Visit to TV transmitter/Studio
- DTH and set top box.
- CD/DVD players
- PA system with cordless microphone
- FAX
- Microwave oven
- Washing machine
- Refrigerator

Note

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**
- **ESE –** End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute

ET357UA INFORMATION THEORY AND CODING TECHNIQUES LAB

Teaching Scheme	**:** 02P; Total: 02	**Credits**	**:** 02
Evaluation Scheme	**:** 25 ICA + 25 ESE	**Total Marks**	**:** 50

COURSE DESCRIPTION

This course will impart the basic concepts of information theory and coding techniques. In the course, emphasis is given on information theory, entropy, various source coding techniques for data compression and various channel coding techniques for error detection and correction.

DESIRABLE AWARENESS/SKILLS

Knowledge of digital communication, probability and fundamentals of communication systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. impart the knowledge of principles of information theory as applied for digital information sources
2. develop the ability to design source coding for the given information source
3. enable the students to demonstrate the knowledge of various channel coding schemes for error detection and correction

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. demonstrate the knowledge of information theory and entropy
2. design the source coding for the given information source using algorithms such as Shannon-Fano and Huffman coding
3. design the channel coding scheme for the given requirements using techniques of block, cyclic and convolution codes
4. select a suitable source and channel coding scheme for the given requirements

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	3	2							2	3	2	2
2	3	2	3	2	2								3	2	3
3	2	3	3	2	2								2	2	2
4	3	2	2	2	1								3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly Correlated

Minimum ten experiments shall be performed so as to cover entire curriculum of course ET354UA**.** Experiments may be performed using hardware set-up or using software / simulator, as per the availability. The list given below is just a guideline.

List of Experiments

- Evaluation of amount of information and entropy for a given message and information source
- Huffman algorithm for source coding
- Shannon-Fano algorithm for source coding
- Encoding for block code
- Error correction using block code
- Encoding for cyclic code
- Error correction using cyclic code
- Encoding for convolution code
- Error correction using convolution code (Viterbi algorithm)
- Design of a source and a channel code for the given bit-stream and given information source.

Note

- **ICA –**Internal Continuous Assessment (ICA) shall support for regular performance of practical and its regular assessment. In addition, it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10)

- **ESE –** End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET357UB BIO-INFORMATICS LAB

Teaching Scheme	**:** 02P Total: 02	**Credit**	**:** 01
Evaluation Scheme	**:** 25ICA + 25ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course provides necessary background to understand the history and appreciate the field of cell biology and genetics. It includes introduction to the bio-informatics and data searches, pair wise alignments and substitution patterns. The distance based and character based methods of phylogenetics.

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic human anatomy and physiology and biomedical engineering

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand fundamental aspect of the course
2. focus on methods and applications pertaining to genomics and proteomics

COURSE OUTCOMES

On successful completion of this course; student shall be able to

1. demonstrate the knowledge of the modern health care system and role played by biomedical engineers
2. illustrate genome, gene mapping, genome sequence
3. analyze man-instrument system and implement the problems encountered in attempting to obtain measurement from living body

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	1	1		1						3		
2	2	3	2	1	1		2						3		
3	2	3	2	1	1		2						3		

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Minimum eight experiments shall be performed to cover entire curriculum of course ET354UB. The list given below is just a guideline.

List of Experiments

- Sequence Statistics
- Pairs of sequences
- Genome data

- Genomes comparisons
- Significance of an alignment
- Evolutionary distance measurement
- Profile analysis of a protein family
- Hominidae species
- Viruses (e.g. bird flu)
- Phylogenetic trees

Note

- **ICA –**It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE** – It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET357UC EMBEDDED SYSTEMS LAB

Teaching Scheme	**:** 02P; Total: 02	**Credit**	**:** 01
Evaluation Scheme	**:** 25ICA + 25ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course provides hand on experience in designing and programming with ARM 7/9. The laboratory exercises are designed to give ability machine, assembly and C-programming with ARM 7/9.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET354 CU Embedded Systems

COURSE OBJECTIVES

The objectives of offering this course are to

1. learn simple ARM 7/9 processor programming with c cross compiler
2. paraphrase RTOS principles
3. develop applications with ARM peripheral interface

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. perform simple C language programs with ARM 7/9 processor
2. demonstrate use of inter process communication techniques like semaphores etc
3. develop applications with ARM peripheral interface

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	3	2	1								1		
2	1	3	3	2	1									2	
3	1	3	3	2	1									2	

Minimum ten experiments shall be performed to cover entire curriculum of course ET354 UC. The list given below is just a guideline

List of Experiments

- I/O operations/ Timers and counters/Interrupts
- UART operation
- I2C Protocol/ CAN Protocol/USB protocol
- Interface Keyboard and display key pressed on LCD
- Interface stepper motor
- Implementation of algorithm / program for the microcontroller for low power modes

- Interfacing 4x4 matrix keyboards and 16x2 character LCD display to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key
- Writing a scheduler using RTOS for 4 tasks with priority. The tasks may be Keyboard, LCD, LED etc. And porting it on microcontroller / microprocessor
- Implement a semaphore for any given task switching using RTOS on microcontroller board
- RTOS based interrupt handling using Embedded Reat Time Linux
- Program for exploration of (Process Creation, Thread Creation) using Embedded Real Time Linux
- Program for exploring Message Queues using Embedded Real Time Linux
- Ethernet based Socket Programming using Embedded Real Time Linux

Note

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET358U OBJECT ORIENTED PROGRAMMING LAB

Teaching Scheme	**:** 02P Total: 02	**Credit**	**:** 01
Evaluation Scheme	**:** 25 ICA+25 ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3Hrs		

COURSE DESCRIPTION

This course explores concepts of C++ programming language and enables the students to apply them in the context of object oriented programming.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic C programming

COURSE OBJECTIVES

The objectives of this course are to

1. introduce the students to the concepts of object oriented programming using C++
2. build object oriented programming application using C++

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. understand the philosophy of object-oriented design and the concepts of encapsulation, abstraction, inheritance and polymorphism
2. design, implement, test, and debug simple programs in an object-oriented programming language
3. demonstrate the class mechanism encapsulation and information hiding
4. design, implement, and test "is-a" relationships among objects using a class hierarchy and inheritance
5. develop the overloading and overriding methods in an object-oriented language

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	2	1	2	2										1
2	1	2	2	2	1										1
3	1	2	2	2	1										1
4	1	2	2	2	1										1
5	1	2	2	2	1										1

1 –Weakly correlated 2 –Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Object Oriented Programming

Introduction to procedural, object oriented limitations of procedural programming, need of object-oriented programming

Classes and Objects

Defining a class, data members and methods, public, private and protected members, static data members, static member, constructors, destructors, friend function and array of objects

Overloading

Need of operator overloading, types: unary and binary operators, operator overloading using friends, function overloading, dynamic memory allocation using new and delete operators

Minimum eight experiments shall be performed to cover entire theory content of the course. The list given below is just a guideline

- Object and class
- Arithmetic operations
- Record (Standard data base)
- Constructors
- Overloading constructor functions
- Array of object
- Unary/Binary operator using friend function
- Function overloading
- Dynamic memory allocation

Text Books

1. Object Oriented Programming With C++, E. Balagurusamy, 4th edition, Tata Mc GrawHill , 2008
2. Object-Oriented Programming in C++, R. Lafore, 4th edition, Pearson Education India, 2002

Reference books

1. Object Oriented Programming with ANSI and Turbo C++, A. N. Kamthane, 7th impression, Pearson Education, 2009
2. C++ The Complete Reference, H. Schildt, 5th edition, Tata McGraw-Hill Education, 2012

Note

- **ICA –**Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill

acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S10).**

- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET359U DEVELOPMENT ENGINEERING PROJECT

Teaching Scheme : 02P; Total: 02 **Credit** : 02
Evaluation Scheme : 50 ICA + 50 ESE **Total Marks** : 50
ESE Duration : 3 Hrs

COURSE DESCRIPTION

The development engineering project is one of the most important single piece of work in the program. It is introduced in curriculum to put into practice some of the techniques and skills that have been taught and/or acquired in earlier years of study. It also provides the opportunity to students to demonstrate independence and originality, to plan and organize a large project over a long period. The project topic should be selected to ensure the satisfaction of the need to establish a direct link between the techniques they learn and productivity. It should reduce the gap between the world of work and study, leading to a development project for solution of societal problems.

DESIRABLE AWARENESS/SKILLS

Knowledge of concepts, principles and techniques studied in all earlier courses

COURSE OBJECTIVES

The objectives of offering this course are to

1. develop ability to synthesize knowledge and skills previously gained and to put some of them into practice
2. make students capable to select from different methodologies, methods and forms of analysis studied to produce a suitable system or sub-system
3. inculcate ability to present the findings of their technical solution in a written report
4. plan and organize a large project over a long period

COURSE OUTCOMES

On the successful completion of the course, student shall be able to

1. apply the knowledge and skills previously gained for solution to societal problems
2. design the values of various components / parameters related to production of a system or sub-system
3. exhibit the leadership qualities along with ability to work in a group
4. demonstrate the ability to present the findings in a written report or oral presentation

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	3	2	2	2	3	2	2	3	2	3	2	2
2	1	2	3	2	2	2	1	2	2	2	3	2	3	2	3
3	2	3	3	2	2	2	2	2	3	3	2	2	2	2	2
4	2	2	2	2	1	2	2	2	3	3	2	2	3	2	2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly Correlated**

COURSE CONTENT

- The development engineering project shall be preferably carried out in-house i.e. in the departmental laboratories with emphasis on societal / field problems by a group of 2 – 4 students.
- The project shall consist of design and implementation of any suitable electronic system, sub system or circuit based on knowledge and skills previously gained.
- The project outline (a brief or condensed information giving a general view of mini project topic) on the selected topic should be submitted to the course coordinator for approval within one weeks from the commencement of the term.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation.
- **Project deliverables:** A project report as per the specified format (available on in the department and institutes website), developed system in the form of hardware and/or software. In addition, student shall maintain a record of attendance and continuous progress (log book in appropriate format available on institute / department's web site) duly signed by course coordinator and present as project deliverable along with report.

EVALUATION SYSTEM

It includes Internal Continuous Assessment (ICA) and End Semester Examination (ESE). Guidelines for ICA and ESE are given below.

- **ICA -** The ICA shall be evaluated by course coordinator. Course coordinator shall judge the students on the principle of continuous evaluation and contribution of individual student in the group. It shall be evaluated on the basis of deliverables of development engineering project and depth of understanding. Course coordinator shall maintain the record of continuous evaluation in appropriate format available on institute/department's web site.

- **ESE -** The End Semester Examination for this course shall be based on demonstration of the system or sub system developed by the group of students, deliverables of the project and depth of understanding (oral examination). It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET453UA WIRELESS SENSOR NETWORKS

Teaching Scheme	**:** 03L+00T; Total: 03	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3Hrs		

COURSE DESCRIPTION

This course provides a wide idea of Wireless Sensor Networks (WSN), sensor node hardware architecture, network protocols as well as the applications of wireless sensor networks.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic concepts in digital communication and computer networking

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a firm grasp of the operating principles of wireless sensor networks
2. understand the concepts of network architecture, protocols, data storage and manipulation
3. introduce students with applications of wireless sensor networks

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. demonstrate the basic concepts of wireless sensor networks
2. learn the design constraints and principles of network architecture
3. compare different network and routing protocols
4. identify different data manipulation techniques and applications of wireless sensor networks

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2		3										3	1	
2	2	2	3	2	2								3	2	
3		2	3		2							2	3	2	1
4	2		2	2	2							2	2		1

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Fundamentals

Introduction to sensor networks, unique constraints and challenges, advantages and applications of sensor networks, performance metrics, design factors, mobile ad-hoc

networks (MANETs) and wireless sensor networks, enabling technologies for wireless sensor networks

Sensor Node Hardware and Network Architecture

Single-node architecture, hardware components and design constraints, operating systems and execution environments, introduction to TinyOS and nesC, network architecture, optimization goals and figures of merit, design principles for WSNs, service interfaces of WSNs, gateway concepts

Deployment, Configuration and Network Protocols

Localization and positioning, coverage and connectivity, single-hopandmulti-hop localization, self-configuring localization systems, sensor management; Issues in designing Media Access Control (MAC) protocol for WSNs, classification of MAC protocols,S-MAC protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

Routing Protocols

Issues in designing routing protocols, classification of routing protocols, energy-efficientrouting, unicast, broadcast and multicast, geographic routing

Data Storage and Manipulation

Data centric and content-based routing, storage and retrieval in network, compression technologies for WSN, data aggregation technique

Applications

Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring, Building automation, industrial automation, medical applications

Text Books

1. Protocols and Architectures for Wireless Sensor Networks, H. Karl and A. Willig, John Wiley and Sons, India, 2012
2. Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, Springer Verlag, 1st Indian reprint, 2010
3. Wireless Sensor Networks: An Information Processing Approach, F. Zhao and L. Guibas, Morgan Kaufmann Publishers,1st Indian reprint, 2013

Reference Books

1. Wireless sensor Network and Applications, Yingshu Li, MyT. Thai, Weili Wu, Springer series on signals and communication technology, 2008
2. Wireless sensor Network: Technology, Protocols and Application, Kazem, Sohraby, Daniel Minoli, TaiebZanti, 1st edition, John Wiley and Sons, 2007

ET453B ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

Teaching Scheme	**:** 03L+ 00T Total: 03	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE +60ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course introduces the fundamentals of Artificial Intelligence (AI) and Neural Networks (NN) as a multidisciplinary field that requires a range of skills in statistics, mathematics, analysis and their applications in engineering.

DESIRABLE AWARENESS

Calculus, Linear Algebra, Statistics and Predominant Programming Language

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide the most fundamental knowledge to the students so that they can understand AI and NN
2. identify problems where AI and NN techniques are applicable
3. understand and apply some general purpose search algorithms
4. make aware the students about the feedforward and feedback neural networks with their applications

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. demonstrate the fundamental knowledge of artificial intelligence, architecture of expert systems and intelligent systems
2. compare and apply suitable search techniques for solving AI problems
3. analyze and apply some feedforward neural networks
4. analyze and apply some feedback neural networks
5. learn the applications of NN in the domain of Electronics and Telecommunication engineering

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1									2	1	
2	2	3	2	2	2								3	1	
3	3	2	2	1	3								2	2	1
4	3	2	1	1									2	1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals

Definition, applications and examples of artificial intelligence (AI), terminology, AI issues: concerns and ethical considerations, expert systems: architecture, functions of various parts, mechanism and role of inference engine, types of expert systems, tuning of expert systems

Intelligent Agents

Agents and environments, good behavior, the nature of environment, the structure of agents- agent programs, simple reflex agents, model-based reflex agents, goal-based agents, utility-based agents, learning agents

Problem Solving and Search

Problem solving agents, well-defined problems and solutions, formulating problems, examples problems, uninformed search strategies-breadth first, depth first, bidirectional search, comparison of uninformed search strategies, informed search strategies- greedy best fit search, memory bounded heuristic search, local search algorithm and optimization problems-hill climbing search and genetic algorithm

Fundamentals of neural networks

Definition, introductory terminology and concepts, characteristics of problems suitable for NN, applications of ANN, basic models of NN: types based on connections, learning and activation functions, mcculloch-pittsneuron, learning rules: Hebbian, perceptron, delta: least mean square (LMS) rule, Hebb network: theory, training algorithm

Feedforward Neural Networks

Singlelayer perceptron classifiers- Classification model, discriminant functions, linear machine and minimum distance classification, training and classification using the discrete perceptron, single-layer continuous perceptron networks for linearly separable classifications, multi-category single-layer perceptron network

Multilayer Feedforward Networks-Linearly non-separable pattern classification, Delta learning rule for multi-perceptron layer, feedforward recall and error back-propagation training

Feedback Neural Networks

Introduction, discrete Hopfield network-architecture, training and application algorithm, analysis, continuous Hopfield network, Boltzman machine

Case Studies

Application of neural networks in image classification, image segmentation, neural network controller, spectrum allocation in cognitive radio

Text books

1. Artificial Intelligence A modern approach, Stuart Russel, Peter Norvig, 2nd edition, fourteenth reprint, Pearson Education,2013
2. Artificial Intelligence and Neural Networks, K. Uma Rao, Pearson Education, 2011

3. Introduction to Neural Networks Using MATLAB 6.0, S.N. Sivanandanam, S. Sumathi, S.N. Deepa, 1st edition, McGraw Hill Education, 2017
4. Introduction to Artificial Neural Systems, Zurada Jacek M., 5th edition, Jaico Publishing House, 2004

Reference books

1. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, 3rd edition, PrenticeHall of International, 2000
2. Artificial Neural Networks, Robert J. Schalkoff, Tata McGraw Hill edition, 2011
3. An Introduction to Genetic Algorithms, Melanie Mitchell, 2nd edition, MIT Press, 1999

ET453UC BIO-MEDICAL ELECTRONICS

Teaching Scheme : 03L+ 00T; Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA +30MSE +60ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course provides necessary background to understand and appreciate the field of biomedical engineering. It includes introduction to the biomedical instruments and measurements.

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic human anatomy and physiology, electronic instruments and measurement

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand fundamental aspect of biomedical
2. converse about the use, service and application of biomedical instruments

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. demonstrate the knowledge of the modern health care system and role of biomedical engineers
2. evaluate the sources of biomedical signals, basic medical equipment
3. analyze man-instrument system and implement the problems encountered in attempting to obtain biological measurements

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	1	1	1	1						3		
2	2	3	2	1	1	3	2						3		
3	2	3	2	1	1	2	2	3	2	1	1	2	3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Human Body and Related Measurement

Elementary ideas of cell structure, action potential, propagation, heart and circulatory system, central nervous system, muscle-skeletal system, respiratory system, and reproductive system, basics of biomedical instrumentation system, sources of biomedical signals, transducers and sensors: pressure transducers, transducer for temperature measurement, displacement, position and motion transducers, photoelectric transducers, etc.

Biomedical Signals and Equipment

Bioelectric signals Electrocardiogram (ECG), Electromayogram (EMG), Electroencephalogram (EEG), Electrooculogram (EOG) and Electroretinogram (ERG) and their characteristics, electrodes: types, interface issues, diagnostic, therapeutic and clinical laboratory equipment; electric safety: micro and macro shocks, grounding and safety

Signal Recording and Patient Monitoring System

Physiological pre-amplifier and specialized amplifiers, electrode systems and machines: ECG, EMG, and EEG; measurements: heart rate, pulse rate, respiration rate, blood pressure, ECG and EEG analysis, computerized catheterization, audiometer and audiometric tests, electrocautery machine, shortwave and microwave diathermy, patient monitoring, artificial respirator, defibrillators and pacemakers

Scanning Techniques

Basic X-ray components and circuits, types of X-ray machines biological effects of X-rays and precautions, Computerized Axial Tomography (CAT), ultrasonic and Magnetic Resonance Imaging (MRI) techniques: fetus monitoring and other, introduction to T-rays

Text books

1. Biomedical Instrumentation and Measurements, L. Cromwell, F. J. Weibell, E. A. Pfeiffer, 2nd edition, Prentice Hall of India, 1980
2. Biomedical Instrumentation and Measurement, J. J. Carr, J. M. Brown, 3rd edition, Pearson Education, 1996
3. Biomedical Instruments, D. S. Chaudhari, 1999

Reference books

1. Biomedical Instrumentation, R. S. Khandpur, 2nd edition, Tata McGraw Hill, 2012
2. Medical Instrumentation, J. G. Webster, 2nd edition, John Wiley, 2006
3. Principles of Medical Electronics and Biomedical Instrumentation, C. S. R. Rao, S. K. Guha,1stedition, Universities Press, 2001

ET453UD FIBER OPTIC COMMUNICATION

Teaching Scheme : 03L+ 00T Total: 03 **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60ESE **Total Marks** : 100
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course is designed to lay the foundation for studies in areas such as fiber optic communication. It will explore the basic concepts of fiber optic communication and understand types of fibers, such as single mode fibers, monomode fibers and multimodal fibers are studied. This course emphasizes on understanding basics of fiber optic Communication.

DESIRABLE AWARENESS/SKILLS

Awareness of basic concepts of fiber optic communication and LED, LASER diode

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand basic concepts of fiber optic communication
2. know the Laser diode and detectors

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. solve numerical based on Acceptance angles and Numerical aperture
2. apply the wave theory of optical propagation
3. illustrate basic concepts of wave theory of optical propagation
4. identify the light emitting diodes and a LASER diode
5. demonstrate optical fiber measurements to measure attenuation, dispersion, refractive index

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	2	2	3	2	3	3				3		
2	3	2	2	2	2								3		
3	3	2	2	2	2								3		
4	3	2	2	2	2								3		
5	1	3	2	2	2								3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Optical fiber Communication Systems

Basic optical fiber communication system, comparison of optical fiber communication with other communication systems, ray theory of transmission and concept of acceptance

angle and numerical aperture, meridonial and skew propagation ,wave theory of optical propagation: cut-off wavelength, group velocity and group delay, types of fibers

Light sources and Detectors Sources

Light Emitting Diode (LED) and types: Surface Emitter, Edge emitter LEDs, LED operating characteristics, radiation patterns of Surface and Edge emitters

Light Amplification by Stimulated Emission of Radiation (LASER) diode: Its principles, semiconductor LASER diode, hetero junction, strip-geometry, operating characteristics, radiation patterns; Detectors**: c**haracteristics or factors for their Selection, P-N photodiode, P-I-N Photodiode, avalanche photodiode; detector parameters: quantum efficiency, responsivity, speed of response

Losses and Measurements in Optical System

Losses in fibers, absorption, scattering and bending losses, signal distortion in optical fiber, material , waveguide, and intermodal dispersion

Noise in optical fiber: thermal, shot, S/N ratio, noise equivalent power

Optical Transmission and Reception

Optical transmitter and receiver circuit**,** LED modulation and circuits, analog and digital circuits

Advanced Systems and Techniques

Fiber Optics System Design Optical power budgeting, Rise time budgeting, Detection: Coherent, Heterodyne and Homodyne, Optical Time Domain Reflectometer (OTDR), optical Networks: Synchronous Optical Networking (SONET)

Text Books

1. Optical Fiber Communication (principles and Practice), J. M. Senior, 3rd edition, Pearson Education, 2014
2. Optical Fiber Communication , G. Keiser , McGraw Hill , 5th edition,2009

Reference Books

1. Fiber Optic Communication System, G. P. Agrawal , Wiley Publication, 2010
2. Fiber Optics and Optoelectronics, R. P. Khare, Oxford, 2010
3. Fiber Optic Communication System and components, V. Mishra, S. P. Ugale, Wliey India, 2012

ET457UAWIRELESS SENSOR NETWORKS LAB

Teaching Scheme	**:** 02P; Total: 02	**Credits**	**:** 01
Evaluation Scheme	**:** 25ICA + 25 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3Hrs		

COURSE DESCRIPTION

In this course, the student will acquire hands-on experience of wireless sensor network with any simulation tool. This course enables student to understand and validate the theory behind wireless sensor networks. The course covers experiments on installation of network simulator, simulation of sensor nodes, communication between mobile nodes, and different routing protocols.

DESIRABLE AWARENESS/SKILLS

Fundamentals of the course wireless sensor networks and computer networking

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a firm grasp of the operating principles of wireless sensor networks
2. understand and implement the concepts of network architecture, protocols, data storage and manipulation
3. introduce students with applications of wireless sensor networks

COURSE OUTCOMES

On the successful completion of this course; students shall be able to

1. install wireless sensor networks in a simulator
2. learn the design constraints and principles of network architecture
3. simulate and compare different network and routing protocols

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2		3										3	1	
2	2	2	3	2	2								3	2	
3		2	3		2							2	3	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed to cover entire curriculum of course ET453UA using simulation software. The list given below is just a guideline.

- Introduction of wireless sensor network applications and its simulation
- Network Simulator installation of wireless sensor network
- TCL script for transmission between mobile nodes

- TCL script for sensor nodes with different parameters
- TCL script for UDP/ CBR traffic in WSN nodes
- TCL script for TCP / CBR traffic in WSN nodes
- Routing protocol in NS2 for AODV protocol
- Routing protocol in NS2 for DSR protocol
- Routing protocol in NS2 for TORA protocol
- Study other wireless sensor network simulators

Note

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.

- **ESE –** The end semester examination (ESE) for this laboratory course shall be based on oral examination to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET457UB ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS LAB

Teaching Scheme : 02 PR; Total: 02 **Credit :** 01
Evaluation Scheme : 25 ICA + 25 ESE **Total Marks** : 50

COURSE DESCRIPTION

This course introduces the student to practical aspects of artificial intelligence (AI) and neural networks using a suitable simulation environment. The course covers experiments on standard problems in AI and neural networks.

DESIRABLE AWARENESS

Concepts of the course Artificial Intelligence and Neural Networks and knowledge of simulator environment

COURSE OBJECTIVES

The objectives of offering this course are to

1. provide students with a firm grasp of the operating principles of artificial intelligence and neural networks
2. simulate the concepts of artificial intelligence to solve some standard AI problems
3. simulate the concepts of neural networks

COURSE OUTCOMES

On the successful completion of this course, students shall be able to

1. compare and apply suitable techniques for solving AI problems
2. analyze and apply some feedforward neural networks
3. analyze and apply some feedback neural networks

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	2								2	1	1
2	1	3	2	2	2								2	1	1
3	1	3	2	2	2								2	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed to cover entire curriculum of course ET453UB. The list given below is just a guideline.

List of Experiments

- Introduction to Prologue
- Monkey Banana problem
- Four-Queens problem
- Traveling salesman problem

- Demonstration of genetic algorithm using standard module
- Learning rules and activation functions in neural network
- Multilayer perceptron and Hebb neuron model
- Demonstration of LMS learning rul.
- Supervised learning using neural network (NN) Toolbox
- Perceptron neural network algorithm
- Error back propagation algorithm using standard module
- Auto associative network using outer product rule

Note

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.

- **ESE –** The end semester examination (ESE) for this laboratory course shall be based on oral examination to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET457UC BIO-MEDICAL ELECTRONICS LAB

Teaching Scheme : 02P **Total:** 02 **Credit** : 02
Evaluation Scheme : 25ICA + 25ESE **Total Marks** : 50
ESE Duration : 3 Hrs

COURSE DESCRIPTION

This course provides necessary background to understand and appreciate the field of biomedical engineering. It includes introduction to the biomedical instruments and measurements.

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic human anatomy and physiology, electronic instruments and measurement

COURSE OBJECTIVES

The objectives of offering this course are to

1. understand fundamental aspect of course
2. converse about the use, service and application of biomedical instruments

COURSE OUTCOMES

On the successful completion of this course student shall be able to

1. demonstrate the knowledge of the modern health care system and role of biomedical engineers
2. perform the experiments on biomedical signals, basic medical equipment express use of scanning techniques

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	1	1	1	1						3	2	1
2	2	3	1	2		3	2						1	3	2
3	2	3	2	1	1	2	2				1	2	2		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum eight experiments shall be performed to cover entire curriculum of course ET453UC.The list given below is just a guideline.

List of Experiments

- Biomedical electrodes
- Blood pressure measurement
- ECG amplifier
- ECG waveform

- EEG waveforms
- Pulse rate and temperature
- Shortwave / Microwave diathermy
- Audiometer
- Ultrasound technique
- X -ray, CAT scan
- MRI technique
- Grounding and safety
- Field visits to hospital/ medical college

Note

- **ICA –**It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

- **ESE** – It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ET457UD FIBER OPTIC COMMUNICATION LAB

Teaching Scheme	**:** 02P Total: 02	**Credit**	**:** 01
Evaluation Scheme	**:** 25 ICA+25 ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3Hrs		

COURSE DESCRIPTION

This course is designed to lay the foundation for studies in areas such as fiber optic communication. It will explore the basic concepts of fiber optic communication and understand types of fibers, such as single mode fibers, monomode fibers and multimodal fibers are studied. This course emphasizes on understanding basics of fiber optic Communication.

COURSE OBJECTIVES

The objectives of offering this course are to

1. implement optical fiber circuits .
2. study LASER diode and LED
3. study monomode fibers, multimode fibers and graded index fibers

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. implement electrical characteristics of Laser diode
2. realize numerical aperture of fibers
3. design analog and digital link for optical fibers
4. realize set up for optical fiber communication

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2		3										3	1	
2	2	2	3	2	2								3	2	
3		2	3		2							2	3	2	1
4	2		2	2	2							2	2		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed to cover entire theory content of the course 453UD. The list given below is just a guideline.

List of Experiments

- V-I Characteristics of LED
- Electrical Characteristics of Laser diode
- Photometric characteristics of LED of different wavelengths
- Numerical Aperture of single mode and multi mode graded index fiber

- Attenuation due to angular misalignment
- Attenuation due to longitudinal misalignment
- Propagation loss of given fiber
- Bending loss of given fiber
- Spectral characteristics of LED/LASER diode
- Set up analog link and measure various parameters like 3 db optical bandwidth, 3db electrical bandwidth
- Set up digital link and measure various parameters like 3 db optical bandwidth, 3db electrical bandwidth
- Fiber Optical Connectors
- OTDR

Note

- **ICA –**Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S10).**

- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.