SH 226U ENGINEERING MATHEMATICS

Teaching Scheme	**:** 03L+ 01T Total: 04	**Credit**	**:** 04
Evaluation Scheme	**:** 10 ISA + 30 MSE +60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs		

COURSE DESCRIPTION

This course introduce the student to higher order differential equation, integral transforms, vector calculus, statistics and probability distribution and complex variables and their applications in engineering.

DESIRABLE AWARENESS/SKILLS

Basic of differential equation, statistic, vector calculus and complex numbers

COURSE OBJECTIVES

The objectives of offering this course are to

1. teach them to solve differential equation, integral transforms, vector, calculus, statistic and probability distribution and complex functions.
2. equip the students with standard concept and tools at an intermediate
3. advanced level that will serve them well towards lacking various problems in discipline.

COURSE OUTCOMES

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

1. solve differential equations and apply the knowledge to engineering problems
2. apply the idea of statistics, probability distribution calculus for problem analysis and solution.
3. apply the idea of integral transform for problem analysis and solution.
4. apply the idea of vector calcus for the problem analysis and solution.
5. demonstrate the knowledge of complex variables, complex functions and related concepts.

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

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

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

COURSE CONTENT

Higher Order Linear Differential Equations

n^{th} order linear differential equations with constant coefficient, complementary function and particular integrals, general method, short cut method, method of variation of parameters, linear differential equations with variable coefficient: Cauchy's differential equations and

Legendre's differential equations, simultaneous linear differential equations, applications: L-R-C circuits.

Integral Transform

Laplace Transform - definition, Laplace transform of elementary functions, properties of Laplace transform, Inverse Laplace transform - definition and properties, Inverse Laplace transform by partial fraction, convolution theorem and standard results, Application of Laplace transform to LDE. (Fourier integral, Fourier sine and cosine integrals), Fourier transforms - definition and properties, Inverse Fourier transforms:- definition and properties.

Vector Calculus

Vector differentiation and its physical interpretation, vector differential operator, gradient, divergence and curl, directional derivatives, solenoidal and irrotational fields, vector identities, vector integration: line integral, surface integral, volume integral, green's lemma, gauss divergence theorem, stokes theorem.

Statistics and Probability Distributions

Measures of central tendency, dispersion, moments, skewness and kurtosis, covariance, Karl Pearson coefficient of correlation, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves. Probability distribution- binomial distribution, Poisson distribution, normal distribution

Complex Variables

Functions of complex variables, analytic functions, C-R equations, conformal mapping, bilinear transformation, Cauchy's theorem, Cauchy's integral formula, Cauchy's residue theorem

Text books

1. A Textbook of Engineering Mathematics (Vol-I and II), P.N.Wartikar and J.N.Wartikar, 7th edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013
2. A Textbook of Engineering Mathematics, N.P.Bali and Manish Goyal, 9th edition, Laxmi Prakashan, 2014

Reference books

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8th edition , Willey Eastern Ltd. Mumbai, 2013
2. Higher Engineering Mathematics, B. S. Grewal, 33rd edition , Khanna Publication, New Delhi, 1996
3. Advanced Engineering Mathematics, H. K. Dass, 12th edition, S. Chand Publication, New Delhi, 2003
4. Higher Engineering Mathematics, B. V. Ramana, 12th edition , Tata McGraw Hill, Delhi, 2011
5. Statistical methods, Dr. S.P.Gupta, 43rd edition, Sultan chand and Sons, Delhi, 2014

ET201U NETWORK ANALYSIS AND SYNTHESIS

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

COURSE DESCRIPTION

This course introduces to analyze and design concepts of electronic/electrical networks. It covers network theorems, concept of resonance, analysis and interconnection of two port networks. The course introduces design of filters, attenuators and synthesis of network. This course make familiar to transient analysis and Laplace transform of networks.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic electrical engineering and their concepts

COURSE OBJECTIVES

The objectives of this course are

1. to strengthen the ability in the field of network analysis and design including filters and attenuators.
2. to impart strong foundation of time domain and frequency domain analysis.
3. to be familiar with series and parallel resonance.

COURSE OUTCOMES

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

1. apply network theorems to different types of networks.
2. recall and describe graph theory and resonance.
3. estimate two port network parameters and convert from one type to another.
4. classify and construct the filters and attenuators.
5. explain transient and steady state response of various passive networks and analyze networks in frequency domain.

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	3	2								1			1	1	
2	2	1		1	1								1	1	
3	2	3	3										1	1	
4	1	1		1	1								1	1	
5	1	1		1									1	1	

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COURSE OUTCOMES AND BLOOM'S TAXONOMY

Examination-wise Weightage	Course Outcomes (COs)					Total	Bloom's Taxonomy (BT) Levels						Total
	1	2	3	4	5		L 1	L 2	L 3	L 4	L 5	L 6	
MSE	25	40	35	--	--	100	20	30	40	10	--	--	100
ESE	25	15	20	20	20	100	15	30	40	15	--	--	100

COURSE CONTENT

Graph Theory and Network Theorems (AC analysis)
Introduction, tree, co-tree, twigs, links, incidence matrix, tie-set matrix, cut set matrix and their properties. Theorems - superposition, Thevenin, Norton, maximum power transfer

Two Port Networks
Characteristic impedance, propagation constant, image and iterative impedance, reduction of two port network to T and π network, conversion between T and π network, characterization of two port networks in terms of impedance, admittance, hybrid and transmission parameters, inter relationships among parameter sets, reciprocity theorem, and inter-connection of two port networks: series, parallel and cascade

Resonance
Series resonance: resonant frequency, impedance, phase angle, variation of impedance, admittance and current with frequency, bandwidth, quality factor, magnification in resonance; Parallel resonance: resonant frequency for a tank circuit, variation of impedance, admittance and current with frequency, Q factor, magnification and reactance curves

Filters, Attenuators, and Synthesis
Filters: Fundamentals, frequency response and design of constant k prototype low pass, high pass, band pass , band stop , m-derived filter and introduction to composite filters; Introduction to network synthesis (RC, RL) : Foster-I and II, Cauer-I and II forms; Attenuators: definition and units, symmetrical and asymmetrical T and π, asymmetrical L section

Time Domain Analysis
Concept of transient and steady state response, dc response of RL, RC, RLC circuits, sinusoidal response of RL, RC, RLC circuits, solution of two mesh circuits with initial conditions

Laplace Transform
Review of Laplace Transform (s-domain) and its applications to node and mesh analysis

Text Books

1. Circuits and Networks, A. Sudhakar and S. S. Palli, 4th edition, Tata McGraw-Hill, 2010
2. Networks, Lines and Fields, J. Ryder, 2nd edition, Prentice Hall of India, 2006

Reference Books

1. Network and Systems, D. R. Choudhary, 2nd edition, New Age International Publishers, 2014
2. Network Analysis, M.E. V.Valkenburg, 3rd edition, PHI Learning Private Limited, 2011.
3. Engineering Circuit Analysis, W. H. Hayt, Jr., J. E. Kemmerly S. M. Durbin, 8th edition, McGraw-Hill, 2012
4. Principles of Active Network Synthesis and Design, G. Daryanani, edition, Wiley India Pvt. Limited, 2009

ET202U ELECTRONIC DEVICES AND CIRCUITS

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 to semiconductor devices such as diodes, Bipolar Junction Transistors (BJTs), Field Effect Transistors (FFETs), and related components. The course will cover the basic operating principles, biasing methods and applications of these devices. This course provides detailed analysis of small signal low frequency amplifiers using *h* parameters and high frequency BJT using hybrid π model. It includes types and frequency response of amplifiers.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic electronics engineering and its concepts

COURSE OBJECTIVES

The objectives of offering this course are

1. to make students to understand operating principles and characteristics of various semiconductor devices/circuits.
2. to interpret significance of various active devices and strengthen the ability to use them in electronic circuits.

COURSE OUTCOMES

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

1. paraphrase operating principles and applications of semiconductor diodes.
2. illustrate various transistor biasing circuits and h parameter analysis of amplifier.
3. discuss operating principles of FET and illustrate their use as an amplifier.
4. describe high frequency performance of transistor.
5. analyze single and multistage amplifiers and interpret their frequency response.

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**

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	Course Outcomes (COs)					Total	Bloom's Taxonomy (BT) Level						Total
	1	2	3	4	5		L1	L2	L3	L4	L5	L6	
MSE	30	35	35	--	--	100	25	25	50	--	--	--	100
ESE	20	20	20	20	20	100	25	25	35	15	--	--	100

COURSE CONTENT

Semiconductor Diodes

Diode - circuit element, DC load line, piecewise linear model; clipping circuit - clipping at two independent levels; clampers – positive, negative, series and shunt; voltage multiplier circuits; switching and Schottky diode – construction, operating principle, specification and applications, Light Emitting Diode (LED), photodiodes, introduction to opto-coupler.

Bipolar Junction Transistor

Bipolar Junction Transistor (BJT) – biasing techniques, DC and AC load line, bias stabilization, thermal runaway and stabilization; small signal low frequency model and *h* - parameter analysis in all three configurations and their comparison, *h* parameter conversion

Field Effect Transistors

Field Effect Transistor (FET) – types – Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET), construction, electrical characteristics, analysis; biasing techniques – self and voltage divider; depletion and enhancement MOSFET

FET Amplifiers

FET small signal model and parameters; JFET amplifier analysis - Common Source (CS), Common Gate (CG) and Common Drain (CD); MOSFET amplifier analysis - CS, CG and CD; introduction to Complementary Metal Oxide Semiconductor (CMOS) Technology

Frequency Response of BJT Amplifiers

Sine wave testing - Gain curve, phase shift curve, and bandwidth; square wave testing – rise time and tilt; correlation of sine and square wave testing; coupling – types, frequency response, output waveform analysis, gain bandwidth product, multistage amplifier – effects of coupling and bypass capacitors, cascade , cascode configurations and Darlington pair

BJT at High Frequency

CE transistor - Hybrid π model, parameters and their variations – alpha cut off frequency (f_α), beta cut off frequency (f_β) and unity current gain frequency (f_T) ; short circuit current gain with resistive load, single stage frequency response and Gain Bandwidth (GB) product; emitter follower at high frequency

Text Books

1. Integrated Electronics Analog and Digital Circuits and Systems, J. Millman, C C. Halkias, 1991 edition, 48th reprint, Tata McGraw-Hill Education, 2008.
2. Electronic Devices and Circuits Theory, R. L. Boylestad, L.Nashelsky, 9th edition, Prentice Hall of India, 2006.

Reference Books

1. Electronic Devices and Circuits, D. A. Bell, 5th edition, Oxford University Press, 2008
2. Microelectronics Circuits, A. S. Sedra, K. C. Smith, 6th edition, Oxford University Press, 2010

ET203U DIGITAL CIRCUITS AND SYSTEM DESIGN

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

COURSE DESCRIPTION

This course introduces electronic circuits that are used to process and control digital signals. This course introduces number systems and their inter-conversions, the methods for simplifying Boolean expressions. The major focus of this course is to design and analyze combinational and sequential logic circuits. This course helps to understand the importance of digital logic verification and design for testability.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic mathematics and electronics engineering

COURSE OBJECTIVES

The objectives of offering this course are

1. to build strong foundation of number system and various codes
2. to strengthen the ability of students in the field of digital circuit analysis and design
3. to get acquainted with logic families, programmable logic devices and VLSI technology

COURSE OUTCOMES

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

1. describe common forms of number representation and their inter-conversions.
2. develop logical/arithmetic operations using combinational logic circuits.
3. apply concept of sequential circuits and memories for digital system design.
4. design combinational and sequential logic circuits.

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		3
2	1		1	2										2	
3	2	2	1		1									2	3
4	1	2	1										1		

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	Course Outcomes (COs)					Total	Bloom's Taxonomy (BT) Level						Total
	1	2	3	4	5		L1	L2	L3	L4	L5	L6	
MSE	40	40	20	--	--	100	20	20	40	20	--	--	100
ESE	20	20	20	20	20	100	20	20	40	20	--	--	100

COURSE CONTENT

Number Systems and Codes

Types – Decimal, binary, octal and hexadecimal, representation of signed binary numbers, binary codes and types - Binary Coded Decimal (BCD) Codes, excess-3 codes, gray codes, American Standard Code for Information Interchange (ASCII) codes, error detecting and correcting code

Digital Logic Families

Characteristics of logic families, introduction to all types, Transistor-Transistor Logic (TTL), Emitter Coupled Logic (ECL) and Complementary Metal Oxide Semiconductor (CMOS) logic families and their characteristics and comparison, study of data sheet (TTL)

Combinational Logic Circuits

Concept of combinational and sequential circuit, Boolean algebra, simplification of Boolean expression using k-map method and its implementation using min term (Sum of Product), max term (Product of Sum) expression, universal gates half and full adder, subtractor circuits, parallel adder BCD adder, subtractor, digital comparator - 1 bit, 2 bit, code convertors-binary to gray, gray to binary, multiplexer and demultiplexer and their applications, Arithmetic and Logic Unit (ALU)

Sequential Circuits and Counters

Flip-flops: S-R, J-K, master slave J-K, T, D with their applications, conversion; shift register and their applications, counters - design of MOD-N synchronous and asynchronous, up/down (4bit) asynchronous, ring and Johnson

Semiconductor Memory

Introduction, organization, operation, expansion, classification and types; read write memory, Random Access Memory (RAM), static and dynamic RAM, Read Only Memory (ROM), Programmable Read Only Memory (PROM), Erasable Programmable Read Only Memory (EPROM) and flash memories/Electrically Erasable Programmable Read Only Memory (EEPROM), content addressable memory, First in First out (FIFO) memory, Charge Coupled Devices (CCD)memory

Text Books

1. Modern Digital Electronics, R.P. Jain, 4th edition, Tata McGraw - Hill Education, 2010
2. Digital Principles and Applications, Leach, Malvino, 5thedition, Tata McGraw Hill, 2002

Reference Books

1. Digital Electronics: Principles and Applications, R. L. Tokheim, 8th edition, Tata McGraw Hill, 2013
2. Digital Design, M. M. Mano, M. D. Ciletti, 5th edition, Pearson Prentice Hall, 2013
3. Digital Electronics : Circuits and Systems, V. K. Puri, 13th reprint, Tata McGraw-Hill, 2006

ET204U SIGNALS AND SYSTEMS

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 an introduction to signals and systems. It also provides introduction of classification of signals, time frequency characterization. It covers the knowledge of convolution, continuous time Fourier series (CTFS), Fourier transform (CTFT), Laplace transform and random variables.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic engineering mathematics and their concepts

COURSE OBJECTIVES

1. to provide students with a firm grasp of the basic principles of signals and systems.
2. to understand the concepts and applications of CTFS, CTFT and Laplace transform.
3. to introduce students with concepts of random variables.

COURSE OUTCOMES

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

1. demonstrate the understanding of basicconcepts of signals and systems.
2. analyze signal and systems in time domain.
3. analyze signals and system in frequency domain using CTFS/CTFT.
4. apply Laplace transform for analysis of continuous time linear and time invariant systems.
5. evaluate energy and power spectral density of randomsignals.

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	2	
2	2		3	2	2								1	2	1
3	3			2	2								1		
4	3			3	2								1		
5	3	3		1	2+								1		1

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	Course Outcomes (COs)						Total	Bloom's Taxonomy (BT) Level						Total
	1	2	3	4	5	6		L1	L2	L3	L4	L5	L6	
MSE	25	35	40	--	--	--	100	20	20	40	20	--	--	100
ESE	15	20	25	20	10	10	100	15	20	30	15	10	10	100
ISA	--	--	--	--	--	100	100	--	--	70	--	20	10	100

COURSE CONTENT

Fundamentals
Introduction to natural, voice, speech, communication, biomedical signals, mathematical representation of signals: periodic and non-periodic, analog and digital, even and odd, deterministic and random, energy and power signals. Singularity functions: Impulse, step, ramp. Basic operations on signals, precedence rule for shifting and time scaling operation. Systems: Definition, properties: causality, linearity, time invariance, static and dynamic, stable and unstable.

Time domain representation of LTI systems
System representation using block diagram, differential/difference equations, Concept of impulse response, analysis of continuous time linear time invariant (CTLTI) system using convolution integral and discrete time linear time invariant (DTLTI) system using convolution sum, properties of convolution operation and system interconnections, step response, analysis of system properties like memory, stability and causality using impulse response.

Frequency domain representation of LTI systems using Fourier transform
Concept of Eigen functions, Fourier series and transform with their properties. Fourier transform for applications to Linear Time Invariant (LTI) systems. Magnitude and phase representation of Fourier transform, frequency response of LTI systems, time domain properties of ideal frequency selective filters, time and frequency domain aspects of non-ideal filters.

Frequency domain representation of LTI systems using Laplace Transform
Definition, properties of Laplace transform, inversion of Laplace transform, unilateral Laplace transform, applications of Laplace transform for analysis of CTLTI systems.

Probability, Random variables and correlation
Fundamentals of probability theory, conditional probability and statistical independence, Bayes theorem,Uniform and Gaussian probability models. Random variables: Continuous and Discrete random variables, cumulative distributive function (CDF), Probability density function (PDF), properties of CDF and PDF, statistical averages, mean, moments and expectations, standard deviation and variance.
Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

Text Books

1. Signals and Systems, S. Haykin,Wiley, 2nd edition, 2014
2. Fundamentals of Signals and Systems, M. J. Roberts, 2nd edition,Tata McGraw Hill, 2012
3. An Introduction to Analog and Digital Communication, Simon Haykins, Wiley India, 2nd edition, 2006

Reference Books

1. Signals and Systems, A. V. Oppenphim, A. S. Willsky and S. H. Nawab, 2nd edition,Pearson, 2016
2. Signal and System, B. P. Lathi, 1stedition,Oxford university press, 2010
3. Signals and Systems, Mahmood Nahvi, 2nd edition,Tata McGraw Hill, 2006

ET205U ELECTRONIC MATERIALS AND COMPONENTS

Teaching Scheme	**:** 02L, Total: 02	**Credits**	**:** 02
Evaluation Scheme	**:** 30MSE + 10 ISA + 60 ESE	**Total Marks**	**:** 100
Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course introduces different types of components such as resistors, capacitors, inductors and electronic materials for fabrication of components. This course also focuses on single sided and double sided printed circuit boards (PCB), types of laminates.

DESIRABLE AWARENESS/SKILLS

Knowledge of engineering physics, basic electronics engineering and their concepts

COURSE OBJECTIVES

The objectives of this course are

1. to strengthen the ability in the field of electronic materials and components.
2. to introduce process of fabrication of ICs.
3. to impart the knowledge of PCB manufacturing process.

COURSE OUTCOMES

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

1. demonstrate the understanding of basic concepts of engineering materials.
2. apply the knowledge of electronic components.
3. describe the process of fabrication of integrated circuits.
4. exhibit the knowledge of printed circuit board

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		3	1	1									**1**	
3	1		2		1										
4	1		2	1	1										

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	Course Outcomes (COs)				Total	Bloom's Taxonomy (BT) Level						Total
	1	**2**	**3**	**4**		**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	
MSE	50	50		--	100	40	30	30	--	--	--	100
ESE	25	25	25	25	100	40	30	30	--	--	--	100

COURSE CONTENT

Materials

Materials - matter and energy, conducting, special-purpose materials, insulating, magnetic materials: relative permeability, hard and soft ferromagnets, ferromagnetic materials and ferrites, important dielectrics and alloy

Components

Passive components fabrication: resistors, capacitors, transformers and inductors: core losses, core materials, transformer types, self-inductance and inductors, relays and switches; active components fabrication: Bipolar Junction Transistors (BJT), Field Effect Transistor (FET)

Integrated Circuits (ICs)

Introduction, types of ICs, fabrication of ICs, the planar processes, monolithic integrated circuits, thin film technology, thick film technology, integrated circuits: package types, identification and temperature ranges, clean room requirements for IC fabrication

Printed Circuit Boards (PCB)

Printed circuit boards and types, types of laminates, manufacturing of copper clad laminates, properties of copper clad laminates, PCB manufacturing process, manufacturing of single sided boards, manufacturing of double sided boards. Surface Mount Devices (SMD) - discrete passive components, discrete active components, surface mount integrated circuits

Text Books

1. Electronics Components and Materials, S. M. Dhir, 1st edition, Tata McGraw Hill, 2012
2. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman, C. Halkias, 8th edition , Tata McGraw Hill, 2012
3. Printed Circuit Board, W. C. Bosshart, 37th edition, Tata McGraw Hill, 2012

Reference Books

1. Basic Electronics Solid State, B. L. Therja, 2nd edition, S. Chand and Company ltd, New Delhi, 2006
2. Electronics Components and Materials, Grover and Jamwal, Dhanpant Rai and Co. Pvt.ltd
3. Electrical Engineering Materials Physics Properties and applications, S. P. Seth,3rd edition Dhanpant Rai and Publication 2011

ET 206U NETWORK ANALYSIS AND SYNTHESIS LAB

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

COURSE DESCRIPTION

This course deal with the practical exposure to verification of network theorems, two port network parameters, frequency response of series and parallel resonance circuits, response of series RL and RC circuits, design of filters, attenuators etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET201U Network Analysis and Synthesis

COURSE OBJECTIVES

The objective of this course is

1. to strengthen the ability in the field of network analysis, synthesis and design including filters and attenuators.

COURSE OUTCOMES

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

1 verify network theorems.
2 measure and verify two port network parameters.
3 build and test filters and attenuators.
4 analyze frequency response of resonant circuits.
5 analyze transient and steady state response of RL and RC 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	1		1	1								**1**	**1**	
2	2	1		1	1								**1**	**1**	
3	2	2	3		1								**1**	**1**	
4	1	2		1	1								**1**	**1**	
5	1	2			1								**1**	**1**	

Minimum ten experiments shall be performed to cover entire curriculum of course ET201U. The list of experiments provided below is just a guideline.

List of Experiments

- Thevenin's/Norton's theorem
- Maximum power transfer theorem
- Superposition theorem
- Two port network parameters- Z, Y, ABCD, h
- Response of series circuits - RL and RC
- Constant k filter - low pass and high pass
- m derived filter - low pass and high pass
- Resonant circuits - series and parallel

- T-attenuator - symmetrical and asymmetrical
- π-attenuator - symmetrical and asymmetrical

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

ET207U ELECTRONIC DEVICES AND CIRCUITS 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 deal with the practical exposure to semiconductor diodes, Bipolar Junction Transistors (BJT), Field Effect Transistors (FET), FET and BJT amplifiers, Frequency Response of BJT Amplifiers, etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET202U electronic devices and circuits

COURSE OBJECTIVES

The objectives of offering this course are to impart necessary and sufficient practical exposure of

1. various diode circuits
2. various transistor circuits

COURSE OUTCOMES

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

1. measure and verify diode and transistor parameters.
2. build and test the biasing circuits of transistors.
3. find out frequency response of transistor amplifier circuits.

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	2	2	2								3		
2	2	3	3	2	2								3		
3	2	3	3	2	2								3	1	

Minimum ten experiments shall be performed to cover entire curriculum of course ET202U. The list given below is just a guideline.

List of Experiments

- Diode - Rectifier, clipper and clamper circuits
- Transistor - biasing and configurations (CE, CB, CC)
- Transistor amplifier - CE, CB, CC
- FET/MOSFET - characteristics
- Multistage amplifier - cascade and cascode configuration
- FET/MOSFET - amplifier
- Square wave testing of CE amplifier
- Measurement of *h* parameter
- f_β and f_T with resistive load of a single stage CE amplifier

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.

ET208U DIGITAL CIRCUITS AND SYSTEM DESIGN LAB

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

COURSE DESCRIPTION

This course provides hand on experience in designing and implementing digital and logic circuits. The laboratory exercises are designed to give ability to design, build and implement digital circuits and systems.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET203U Digital Circuits and Systems Design

COURSE OBJECTIVES

The objectives of offering this course are

1. to implement digital circuits using logic gates
2. to construct basic combinational circuits and verify their functionalities.
3. to apply the design procedures to design sequential circuits.

COURSE OUTCOMES

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

1. implement Boolean expression and code converters using gates.
2. realize combinational circuits.
3. design sequential circuits.

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 ET203U. The list given below is just a guideline.

List of Experiments

- Boolean expression – implementation using universal gates
- Gray to binary code convertor
- Parallel adder / subtractor (IC7483)
- Comparator (IC7485)
- Multiplexer and de-multiplexer (IC 74151,74154)
- ALU using IC74181
- Flip-flops – SR, JK, T, D
- Counters – ripple, decade, up/down

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.

ET209U SIGNALS AND SYSTEMS LAB

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

COURSE DESCRIPTION

This course provides a practical exposure tosignals and systems and also classification of signals, time and frequency characterization. It also provides understanding practically verify the concepts of sampling, DFT, random variables and processes.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic engineering mathematics and their concepts

COURSE OBJECTIVES

The objectives of this course are to

1. demonstrate practical implementation of the basic principles of signals and systems.
2. verify the concepts and applications of CTFS, CTFT and LT in the laboratory.
3. provide practical exposure to random variables and processes.

COURSE OUTCOMES

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

1. demonstrate the understanding of basicconcepts of signals and systems.
2. analyze signal and systems in time domain.
3. analyze signals and system in frequency domain using CTFS/CTFT.
4. apply Laplace transform for analysis of continuous time linear and time invariant systems.
5. evaluate energy and power spectral density of random signals.

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	2	
2	2		3	2	2								1	2	1
3	3			2	2								1		
4	3			3	2								1		
5	3	3		1	2+								1		1

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

The term work shall include minimum 10 experiments based on theory syllabus of ET204U signal and systems as per sample list given below, using MATLAB or equivalent MATHCAD, LABVIEW etc application software packages. Sample list is given below but any experiment related to signals and systems can be included.

List of Experiments

- Signal representation
- Signal operations
- Convolution
- Simulation of continuous time LTI system.
- Simulation of discrete time LTI systems.
- Impulse response
- Step response
- Synthesis of signal using CTFS
- Frequency response of analog filter
- Correlation
- Power spectral density of signal
- Probability density function

Note

- **ICA –**It shall support for regular performance of minimum 10 practical's 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 student. The performance shall be assessed experiment wise using internal continuous assessment format(S10).

- **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.

ET210U ELECTRONIC WORKSHOP

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

COURSE DESCRIPTION

This course is designed to provide the practical exposure to electronic components, devices and instruments. In addition, it deals with design and development of Printed Circuit Board (PCB), mounting of circuits, etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET205U electronic material and components

COURSE OBJECTIVES

The objectives of this course are

1. to make familiar with electronic components and devices.
2. to make familiar with PCB manufacturing and circuit mounting.
3. to provide hands on training of electronic instrument handling.

COURSE OUTCOMES

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

1. identify and explain electronic components and devices.
2. construct small electronic circuit.
3. handle electronic instruments.

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

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

List of Experiments

- Analog and digital meters
- Function generator
- CRO
- Power Supplies
- Components and devices
- Soldering shop: Fabrication of any small circuit
- Identification of various types of printed circuit boards and soldering techniques
- PCB design software
- PCB : Artwork, printing, etching and drilling
- Wiring and fitting Shop: Electric board wiring (extension board or any circuit)
- Industrial visit (mandatory)

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).

SH200AU ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Teaching Scheme : 00L **Credit : 00**
Evaluation Scheme : 60 ESE **Total Marks : 60**

COURSE DESCRIPTION

This course is intended to provide basic understanding of Indian traditional knowledge. This course introduces students to the fundamental concept of basic & modern Indian knowledge system as well as Indian tradition.

DESIRABLE AWARENESS

Basic structure of Indian knowledge system & various Indian traditions

COURSE OBJECTIVES

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

1. understand Indian knowledge system
2. understand Indian perspective of modern scientific world view
3. understand basic principles of yoga and holistic health care system
4. develop ability to understand, connect up and explain basics of Indian traditional knowledge
5. understand Indian philosophical tradition

COURSE OUTCOMES

Students are able to

1. remember & apply Indian knowledge system in their personal as well as academic life.
2. apply Indian perspective of modern scientific world view.
3. analyzing basic principles of yoga and holistic health care system.
4. evaluate and explain basics of Indian traditional knowledge.
5. understand basic knowledge about Indian philosophical tradition.

RELEVANCE OF POS AND STRENGTH OF CORRELATION

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

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

COURSE CONTENT

Basic structure of Indian Knowledge System

Ashtadashavidya - Types of vedas - rigveda, yajurveda ,samveda ,atharvveda, types of upaved- ayurveda ,dhanurveda ,gandharva veda ,stapatya veda, limbs of vedang, types of upanga

Modern Science and Indian Knowledge System
Logic, mathematics, phonetics, life sciences, physics, military science

Yoga and Holistic Care
General introduction to yoga, aims and objectives of yoga , psychological aspects and mythological concepts of yoga

Philosophical Tradition (Sarvdarshan)
Various Indian Philosophical Tradition
(Heterodox)- jain, buddhist, ajivika, ajnana, carvaka
Indian Linguistic Tradition- phonology, morphology, syntax, semantics
Indian Artistic Tradition- Understanding key terms in art appreciation: art, craft:
Sculpture – iconography- hindu, buddhist and jaina ,modern sculpture
Architecture - temple architecture -nagara, dravida and vesara ,mosques and mausoleums -tajmahal (any one)
Painting - mural painting – ajanta , mughal and rajput- miniature styles ,modern and contemporary artists
Music - traditional music- classical, folk, bhajan, thumri, dadra, sufi, modern music **:** bhangra, blues, dance, jazz, rock
Dance- classical, semi-classical, folk, tribal, shiva and natraja, bharatan atyam, kathak

Text Book

1. An Introduction to Indian Philosophy, S.C. Chaterjee and D.M. Datta, University of Calcutta, 1984
2. Arts of India, Krishna Chaitanya, Abhinav Publications, 1987
3. Cultural Heritage of India-course material, Sivaramakrishnan (Ed.), Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014

References

1. Foundations of Indian Art, R. Nagaswamy, Tamil Arts Academy, 2002
2. The Wave of life, Fritzof Capra
3. Ed. RN Jha, GN Jha (Eng. Trans.),Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
4. India Arts, Pramod Chandra, Howard Univ. Press, 1st Edition, 1983

ET251U ELECTRONIC CIRCUITS AND APPLICATIONS

Teaching Scheme : 03L + 01 T; Total: 04 **Credits :** 03
Evaluation Scheme :10 ISA+ 30 MSE + 60 ESE **Total Marks :** 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course aims at imparting structural and functional understanding of amplifier circuits as applicable in the area of feedback topologies, class based amplifiers used in audio power applications, differential amplifier and its basic analysis. In addition, detailed study of power management circuits built on voltage regulators, waveform generators and oscillators also forms integral part of the course.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic electronic devices and their electrical characteristics, basic electronic circuits and concepts of network analysis

COURSE OBJECTIVES

The objectives of offering this course are -

1. to study the various transistorized circuits like amplifiers and oscillators.
2. to inculcate the ability of analyzing and synthesizing electronic circuits.
3. to develop efficacy of building and handling power management circuits.

COURSE OUTCOMES

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

1. analyze feedback and power amplifiers
2. implement suitable differential amplifier for various applications.
3. analyze and design various subsystems of function generators.
4. design and develop power supply modules for various electronic circuits/systems.

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	2	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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	Course Outcomes (COs)					Total	Bloom's Taxonomy (BT) Level						Total
	1	2	3	4	5		L1	L2	L3	L4	L5	L6	
MSE	30	35	35	--	--	100	25	25	50	--	--	--	100
ESE	20	20	20	20	20	100	25	25	35	15	--	--	100

COURSE CONTENTS

Feedback Amplifier

Classification of amplifier, concept of feedback, types of feedback (positive and negative feedback), general characteristics of negative feedback amplifier - transfer gain, input resistance and output resistance, negative feedback amplifier - analysis of voltage series, current series, voltage shunt and current shunt negative feedback amplifier

Large Signal Amplifier

Introduction, concept of load line, performance parameter- efficiency and distortion, classification; class A - operating principle and analysis of series fed, transformer coupled power amplifiers, class B - operating principle and analysis; push pull power amplifier with and without output transformer, concept of crossover distortion; class AB - operating principle and analysis; push pull power amplifier with and without output transformer; class C - operating principle.

Differential Amplifiers

Introduction - different modes of operation of differential amplifier, DC and AC analysis of differential amplifier for balanced and unbalanced operation, techniques to improve CMRR of differential amplifier.

Waveform Generators and Wave Shaping Circuits

Concept of oscillator, classification of oscillator, circuit, operation and detailed analysis of phase shift, Wien bridge, Hartley, Colpitt, Clap and crystal oscillator. Methods of generating a time base waveform, exponential sweep RC circuit, a transistor constant current sweep, an inductor circuit used to improve the linearity of RC sweep circuit, transistor current sweep circuit, a current sweep using current feedback to improve linearity.BJT as a switch, astable, bistable and monostable multivibrator, Schmitt trigger circuit.

Regulated Power Supply

Block diagram of regulated power supply, filters–concept, analysis and design of C, L, LC, and CLC filters, voltage regulator - transistorized series and shunt, short circuit protection (using transistor and diode), fold back protection and protection circuit design, series regulator using op-amp, positive/negative (including dual tracking) and fixed/adjustable voltage regulators using IC 723 and three terminal IC

Text Books

1. Millman's Electronic Devices and Circuits, J. Millman, C. C. Halkias, S. Jit, 3rd edition, McGraw-Hill Education (India) Private Limited, 2010
2. Pulse, Digital and Switching Waveforms, J. Millman and H. Taub, 23rd edition , McGraw-Hill international education editions, 1981
3. Electronic Devices and Circuits Theory, R. L. Boylestad, L. Nashelsky, 9th edition, Prentice Hall of India, 2006

Reference Books

1. Electronic Devices and Circuits, D. A. Bell, 5th edition, Oxford University Press, 2008
2. Microelectronics Circuits, A. S. Sedra , K. C. Smith , A. N. Chandorkar, 5th edition, Oxford University Press, 2009
3. Electronics Devices and Circuits, S. Salivahanan, N. Sureshkumar, 3rd edition, McGraw Hill Education (India) Private Limited, 2012

ET252U LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

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

COURSE DESCRIPTION

Contents deal with the basic concepts of operational amplifier (Op-amp), linear and non-linear application of op-amp. It covers design and analysis of frequency selective and tuning circuits like oscillators, active filters, Phase Locked Loop (PLL) and its use for communication applications. Course content finds a due scope to learn Integrated Circuit (IC) based design of switching applications like comparators.

DESIRABLE AWARENESS/SKILLS

Knowledge of electronic components/devices and their applications in analog electronics

COURSE OBJECTIVES

The objectives of offering this course are to impart strong foundation of IC based design of circuits used in the area of

1. signal generation and conditioning
2. analog and digital communication
3. industrial instrumentation

COURSE OUTCOMES

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

1. outline and discuss the internal circuit and parameters of op amp.
2. Discuss and predict the component values of the linear and non-linear circuits of op-amp.
3. analyze and calculate the component values of frequency selective circuits and oscillators.
4. describe PLL and its basic applications.
5. implement IC based circuits in above areas according to specifications.

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	1	1							1			2		
2	3	2	2	1									3		
3	3	2	2	1									3		
4	3	2	2	1									3		
5	2	1	1										3		
6	1	1	2						2		1	1	3		

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	CO						Total	BT Level						Total
	1	2	3	4	5	6		L1	L2	L3	L4	L5	L6	
MSE	25	35	40	--	--	--	100	20	30	40	10	--	--	100
ESE	15	20	25	20	10	10	100	15	30	40	15	--	--	100
ISA Course Project	--	--	--	--	--	100	100	--	--	70	--	20	10	100

COURSE CONTENT

Operational Amplifier
Block schematic of op-amp and its characteristics, in-depth understanding of various stages including internal circuits, op-amp parameters, offset null techniques of op-amp, measurement of op-amp parameters, data sheet interpretation of IC 741, effects of real op-amp parameters on circuit performance, concept of dB and dBm, frequency response and stability, frequency and phase compensation techniques

Linear Applications of Op-amp
Inverting and non-inverting amplifier, voltage follower, peak amplifier, analog adder, averaging amplifier, integrator and differentiator with their frequency response and compensation, differential amplifier and instrumentation amplifier, bridge amplifier, voltage-to-current and current-to-voltage converters, analog multipliers, dividers, log/antilog amplifiers, analog computation - basic building blocks, solution of linear second order differential equation

Non-linear Applications of Op-amp
Comparators – basic configurations, parameters, characteristics, comparator IC 710, op-amp as comparator; comparator applications – peak detectors, window detector, waveform generation circuits like square-triangle wave oscillators, relaxation oscillators and pulse generators, Schmitt's trigger; timer IC 555 – block schematic, pin diagram, operation, parameters; applications of 555 – timer circuit, bistable, astable, mono-stable multi-vibrators and Schmitt's trigger; wave shaping circuits - clippers and clampers, precision rectifiers

Frequency Selective Circuits
Active filters – types and responses, analysis and synthesis of first, second and higher order Butterworth's active filters

Oscillators and Phase Lock Loop (PLL)
Analysis and design of R- C phase shift and Wien bridge oscillators; voltage controlled oscillator IC 566, PLL – operating principles, lock and capture range, PLL IC 565; PLL applications – am and fm detection, Frequency Shift Keying (FSK) decoder, frequency synthesizer.

Text Books

1. Op-amps and Linear Integrated Circuits, R. Gayakwad, 4th edition, Prentice Hall of India, 2008
2. Operational Amplifiers and Linear ICs, D. A. Bell, 3rd edition, Oxford University Press, 2011

3. Linear Integrated Circuits, D. Choudhari, S. Jain, 4th edition, New Age International (P) limited, 2010

Reference Books

1. Design with Operational Amplifiers and Analog Integrated Circuits, S. Franco, 3rd edition, Tata McGraw Hill, 2002
2. Op-amp and Linear Integrated Circuits Theory and Applications, J. Fiore, 1st edition, D. Thompson Learning, 2001
3. Operational Amplifiers and Linear Integrated Circuits, R. Coughlin, F. Driscoll, 6th edition, PHI, 2001

ET253U ANALOG COMMUNICATION

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

COURSE DESCRIPTION

This course provides a thorough introduction to the basic principles and techniques used in analog and pulse communication. The course will introduce communication systems, analog modulation techniques, transmitters and receivers, noise analysis, and multiplexing techniques. The course also introduces analytical techniques of pulse modulation.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic electronics and electrical engineering

COURSE OBJECTIVES

The objectives of offering this course are

1. to enable the students to understand and implement the basic analog communication techniques/circuits with the help of theoretical and practical problem solving.
2. to build strong foundation of time domain and frequency domain analysis of modulation techniques.
3. to familiar with pulse communication.

COURSE OUTCOMES

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

1. describe the communication system and analyze different types of noise.
2. analyze different analog modulation techniques.
3. demonstrate the transmission and reception systems.
4. discuss pulse modulation schemes.
5. recognize and describe multiplexing 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	1	
2	2	2			2								3	3	
3	2			2	2								2		3
4	2				2									2	2
5	2				2					1			2		2

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	CO						Total	BT Level						Total
	1	2	3	4	5	6		L1	L2	L3	L4	L5	L6	
MSE	35	40	25	--	--	--	100	30	30	--	40	--	--	100
ESE	20	20	20	20	20	--	100	25	20	20	35	--	--	100

COURSE CONTENT

Communication System and Noise
Communication system, need and types of modulation; noise - classification, sources, to several amplifiers in cascade, reactive circuits; noise figure - calculation and from measurement; noise temperature.

Amplitude Modulation
Amplitude modulation (AM) - mathematical analysis, modulation index, frequency spectrum, power equation, efficiency, generation (Collector and Emitter modulator), transmitter, high and low level transmitter, demodulation; balanced modulator (using FET, BJT) :Single Side Band (SSB) generation - filter method and phase shift method; Vestigial Side Band (VSB) modulation and demodulation, forms of AM, Independent Side Band scheme (ISB)

Angle Modulation
Frequency modulation (FM) - mathematical analysis, noise triangle, pre-emphasis and de-emphasis; FM generation - direct and indirect method, reactance and varactor diode modulator, stabilized reactance modulator, Armstrong method; narrowband and wideband FM, FM demodulator – basic, balanced slope detector, phase discriminator and ratio detector; Phase modulation (PM) -mathematical analysis

Receivers
Characteristics, types - Tuned Radio Frequency (TRF) , super heterodyne; AM super heterodyne receiver- RF amplifier, mixer-self and separately excited mixer, IF amplifier, practical diode detector, Automatic Gain Control (AGC) and delayed AGC; FM super heterodyne receiver- comparison with AM super heterodyne receiver, amplitude limiting, performance of amplitude limiter

Pulse Modulation and Multiplexing
Sampling theorem, types of sampling - ideal, natural, flat top; Pulse Amplitude Modulation (PAM), Pulse Width Modulation(PWM), Pulse Position Modulation (PPM), concept of quantization, pulse code modulation (PCM), PCM transmitter and receiver, companding, Multiplexing - Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM)

Text Books

1. Electronic Communication Systems, George D. Kennedy, 4th edition, Tata McGraw-Hill, 1999
2. Principles of Communication Systems, T. Schilling and G. Saha, 3rd edition, McGraw-Hill, 1995

Reference Books

1. Communication Systems, A. B. Carlson, 4th edition, McGraw-Hill, 2006
2. Electronic Communication, D. Roddy and J. Coolen, 4thedition, Prentice Hall of India

3. Communication Systems, S. Haykin, 4th edition, J. Wiley and Sons, 2000
4. Communication Systems (Analog and Digital), Dr. S. Sharma, 5th edition, S. K. Kataria and Sons, 2011

ET254U COMPUTER ORIENTED NUMERICAL METHODS

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

COURSE DESCRIPTION

The course covers the basic concepts used in evolving numerical methods with special emphasis on developing computational algorithms for solving problems in algebra and calculus on computer. The approach shall be to ensure conceptual understanding of the numerical methods by relying on students' geometric intuition. The course provides coverage of iterative methods for solving algebraic and transcendental equations, direct and iterative methods of solving simultaneous algebraic equations, numerical methods for differentiation and integration, and solution of ordinary differential equations with initial conditions.

COURSE OBJECTIVES

The objectives of this course are

1. to provide conceptual understanding of various numerical methods, in particular, with reference to numerical solution of non linear equations and system of linear equations.
2. to impart the knowledge of important theorems and different expressions for various numerical methods for practical use of these methods in the field of computational techniques for engineering.

COURSE OUTCOMES

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

1. apply numerical methods for solving a problem.
2. solve linear / non linear equations and interpolation using numerical methods.
3. demonstrate the knowledge of solving numerical differentiation and integration problems.
4. apply the knowledge of numerical differentiation and integration towards numerical solution of ordinary differential equations.

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	3	3								3	2	3
2	3	3	3	3	3								3	3	2
3	3	3	3	2	2								3	2	2
4	3	3	2	2	2								3	2	3

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	CO						Total	BT Level						Total
	1	2	3	4	5	6		L1	L2	L3	L4	L5	L6	
MSE	50	50	--	--	--	--	100	20	30	40	10	--	--	100
ESE	20	20	30	30			100	15	30	40	15	--	--	100

COURSE CONTENT

Errors and Computations

Mathematical preliminaries, algebraic and transcendental equations - graphical and analytical methods- successive approximation, Newton - Raphson, Ramanujan

Matrices and Solutions of Systems of Linear Equations

Existence of solution of systems of linear equations, direct methods - matrix inversion, Cramer's rule, Gauss elimination

Curve Fitting

Methods of curve fitting - graphical (linear law), group averages, moments, and least squares

Interpolation

Interpolation with equal intervals, Newton's forward and backward interpolation, Central differences, Gauss forward and backward formulae, Sterling's formula and Bessel's formula; Interpolation with unequal intervals - Lagrange's formula for interpolation, Inverse Interpolation - Lagrange's method

Numerical Differentiation and Integration

Maximum and minimum value of a tabulated function, differentiation using Newton's formulae, derivatives using general interpolation formula - difference equations; numerical integration,Numerical solution of ordinary differential equations - initial value problems, solution methods - Taylor's series, Euler's, modified Euler's, Runge-Kutta

Statistical Methods

Introduction of probability, total probability theorem, conditional probability, Baye's theorem, probability distributions, discrete and continuous cases, independence of random variables, expectation and variance of a random variable, sampling theory, sampling distributions, central limit theorem and applications, methods of estimation, tests of statistical hypothesis, t-test, p-value

Text Books

1. Computer Oriented Numerical Methods, V. Rajaraman, 3rd edition, Prentice Hall of India, 2016
2. Numerical Methods, E. Balagurusamy ,25th reprint ,Tata McGraw- Hill, 1999

Reference Books

1. Numerical Analysis, R. L. Burden and T. D. Faries, 7th edition, Thomson Asia, Singapore, 2002
2. Numerical Methods for Scientists and Engineers, S. Rao K., 2nd edition, Prentice Hall of India, 2004
3. Numerical Method for Engineer, Chapra, Canale, 5th edition, McGraw Hill, 2005
4. Introductory Methods of Numerical Analysis, S.S. Sastry, 4th edition, Prentice Hall of India, 2009

ET255U POWER ELECTRONICS

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 covering fundamentals of power semiconductor devices, their ratings characteristics and applications. The course will further strengthen the knowledge of the students of construction, working principles performance and application of power converters like AC to DC, DC to DC, DC to AC and AC to AC.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic science and mathematics, electrical engineering, electronic devices and control system

COURSE OBJECTIVES

The objectives of offering this course are to

1. recognize construction, working principle of power semiconductor devices.
2. strengthen knowledge of students about power ratings of power semiconductor devices and their applications..
3. make students familiar with different types of converter for a particular application in power control.

COURSE OUTCOMES

On successful completion of this course, student shall able to

1. demonstrate the knowledge of construction, working principle, characteristics of semiconductor devices.
2. distinguish the ratings of ordinary and power semiconductor devices and their applications.
3. develop the circuits of different power converter circuits for particular application in power control.
4. perform the experiments on the simulation of power converter circuits

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	3	2	2	2									1	2	3
2	3	2	2	2									1	3	2
3	3	2	2	2									2	2	3
4	3	2	2	2											

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

CORRELATED EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY

Examination -wise Weightage	CO						Total	BT Level						Total
	1	2	3	4	5	6		L1	L2	L3	L4	L5	L6	
MSE	40	35	25	--	--	--	100	40	30	20	10	--	--	100
ESE	40	30	20	10	--	--	100	30	40	15	15	--	--	100

COURSE CONTENT

Power Devices

Silicon Controlled Rectifier (SCR), Diode for Alternating Current (DIAC), TRiode for Alternating Current (TRIAC) - background, construction, working, V-I characteristics; SCR turn on and triggering methods - forward voltage, dv/dt, thermal, radiation, gate; protection circuits, commutation and its types, SCR data sheet - rating, electrical characteristics.

AC to DC Converter

Single phase controlled half and full wave rectifiers with R and RL load, average and Root Mean Square (RMS) output voltage, semi-converter with R and RL load.Three phase half and full controlled bridge rectifiers with R and RL load.

DC to DC Converter

Classification, basic chopper operation- step down, step up and step-up/down; control strategies- Time Ration Control (TRC), Current Limit Control (CLC), duty cycle, average and RMS output voltage, configuration - first, second, third and fourth quadrant operations.

DC to AC Converter

Classification, Single phase half bridge and full bridge voltage Source Inverter (VSI) with R and RL load; performance parameters of inverters; Current Source Inverter (CSI), RMS output voltage and power, series inverter, Pulse Width Modulated (PWM) Inverters - single pulse, multi pulse, sinusoidal pulse.

AC to AC Converter

Single phase half and full wave converter with R and RL load, average and RMS output voltage; principle of integral cycle control.

Cyclo-convertors

Single phase step-down and step-up cyclo-convertors using mid-point type and bridge type

Uninterruptible Power Supply (UPS)

Basic principle, configurations - off-line, on-line, line interactive, reliability of UPS system, batteries for UPS - battery capacity, efficiency

Text Books

1. Power Electronics Circuit, Devices and Application, M. H. Rashid, 3rd edition, 13th Reprint, Pearson, 2013
2. Power Electronics Converters, Applications and Design, N. Mohan, 3rd edition, T. M. Undeland, W. P. Robbins, Wiley, 2016

Reference Books

1. Power Electronics, P. C. Sen, 1st edition, 30th reprint, Tata McGraw Hill, 2008
2. Principles of Power Electronics, J. G. Kassakian, M. F. Schlecht, G. C. Verghese, 1st Impression, Pearson, 2011
3. MatLab and Simulink for Engineers, A. K. Tyagi, 1st edition, Oxford University Press, 2012
4. SCR manual

ET256U ELECTRONIC CIRCUITS AND APPLICATIONS LAB

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

COURSE DESCRIPTION

This course provides the practical exposure to feedback, large signal and differential amplifiers. In addition it also deal with the study of waveform generator, wave shaping circuits, regulated power supply, etc

DESIRABLE AWARENESS/SKILLS:

Concepts and theory of the course ET251U electronic circuits and applications

COURSE OBJECTIVES

The objectives of offering this course are to impart necessary and sufficient practical exposure to-

1. various amplifier circuits
2. wave shaping circuits
3. regulated power supply

COURSE OUTCOMES

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

1. find out frequency response of amplifier circuits.
2. build and test waveform generator circuits.
3. design and implement regulated power supply.

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	2	2	2								3		
2	2	3	3	2	2								3		
3	2	3	3	2	2								3	1	

Minimum ten experiments shall be performed to cover entire curriculum of course ET251U. The list given below is just a guideline.

List of Experiments

- Negative feedback amplifier
- Various multi-vibrator circuits
- Schmitt trigger circuit
- Class A power amplifier with resistive load
- Transformer coupled class A power amplifier
- Push-pull power amplifier
- Transistor constant current sweep generator
- Line and load regulation of regulated power supply
- Wein bridge oscillator
- Short circuit protection and fold back protection circuit using transistor and diode

- Emitter coupled DIDO amplifier
- Design and implement regulated power supply (2 turns)

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.

ET257U LINEAR INTEGRATED CIRCUITS AND APPLICATIONS LAB

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

COURSE DESCRIPTION

This course deal with the practical exposure to basic concepts of operational amplifier (op-amp), linear and non-linear application of op-amp, frequency selective circuits, active filters, PLL, and various signal generators, etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET252U Linear Integrated Circuits and Applications

COURSE OBJECTIVES

The objectives of offering this course are to impart necessary and sufficient practical exposure of IC based circuits used in the area of:-

1. signal conditioning
2. signal generation
3. analog and digital communication

COURSE OUTCOMES

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

1. measure and verify op amp parameters.
2. build and test the performance of the various linear and non linear (application) circuits of op-amp.
3. build and test frequency selective circuits and oscillators.
4. use PLL.
5. formulate and implement IC based circuits in above areas according to specifications.

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	1	1							1			2		
2	3	2	2	1									3		
3	3	2	2	1									3		
4	2	1	1										3		
5	1	1	2	1	1			1	2		1	1	3		

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

COURSE CONTENT

Minimum ten experiments shall be performed to cover entire curriculum of course ET252U. The list given below is just a guideline.

- Op-amp parameter measurement
- Inverting and non-inverting amplifier
- Differential amplifier
- Integrator and differentiator
- Precision rectifiers

- Clampers
- Schmitt trigger and the hysteresis voltage.
- Square wave and/or triangular wave generator using Op-amp
- Multi-vibrators using timer IC 555
- Voltage Controlled Oscillator (VCO) using IC 566
- Phase Locked Loop (PLL) using IC 565
- Zero crossing and window detector
- Second order Butterworth filters

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

ET258U ANALOG COMMUNICATION 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 deal with the practical performance on concept like modulation and demodulation, implementation of pre-emphasis and de-emphasis, PAM and PWM. This course also provides practical exposure of AM, FM receiver and basic communication concept.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET253U Analog Communication

COURSE OBJECTIVE

The objectives of this course are

1. to build foundation of basic communication techniques.
2. to provide the knowledge of analog modulation and demodulation schemes to the students.

COURSE OUTCOMES

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

1. perform modulation and demodulation..
2. measure modulation index, gain of RF and IF amplifier
3. build and test pre-emphasis and de-emphasis, PAM and PWM
4. demonstrate the AM, FM reciever and basic communication concept.

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	
2	2	2											2	3	
3	3	2											1		2
4	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 ET253U. The list given below is just a guideline.

List of Experiments

- Amplitude modulation
- Amplitude demodulation
- Balanced modulation using IC 1496
- Frequency modulation(using IC/Varactor diode /BJT /FET)
- Amplitude demodulation(using IC/ratio detector /BJT /FET)
- Pre-emphasis and de-emphasis

- AM super heterodyne receiver
- RF amplifier
- IF amplifier
- FM super heterodyne receiver
- Flat top sampling
- Pulse amplitude modulation
- Pulse width modulation
- Pulse position modulation
- Pulse code modulation
- Delta modulation /adaptive delta modulation

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.

ET259U COMPUTER ORIENTED NUMERICAL METHODS LAB

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

COURSE DESCRIPTION

The course covers the practical aspects of numerical methods with special emphasis on developing computational algorithms for solving problems in algebra and calculus on computer. The approach shall be to ensure implementation of the numerical methods by relying on students' geometric intuition. The course provides software implementation of iterative methods for solving algebraic and transcendental equations, direct and iterative methods of solving simultaneous algebraic equations, numerical methods for differentiation and integration, and solution of ordinary differential equations with initial conditions.

COURSE OBJECTIVES

The objectives of this course are to

1. provide practical aspects of implementation of various numerical methods, in particular, with reference to numerical solution of non linear equations and system of linear equations.
2. impart the knowledge of implementation of important theorems and different expressions for various numerical methods for practical use of these methods in the field of computational techniques for engineering.

DESIRABLE AWARENESS/SKILLS

Knowledge of numerical methods, programming knowledge

COURSE OUTCOMES

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

1. demonstrate the grasping of the techniques by writing a program for solving a numerical analysis problem
2. apply the knowledge of numerical differentiation and integration towards numerical solution of ordinary differential equations by developing suitable logic, flowcharts and programs.

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	3	2	3					1			3	3	2
2	3	2	3	2	3				2	2			3	2	3

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

Minimum 10 programming assignments shall be performed to cover the entire curriculum of the course ET254U using C or C++ programming language. The list given below is just a guideline.

List of Experiments

- Roots of non-linear equation methods – bisection, false position, Newton- Raphson and Ramanujan
- Curve fitting – least square approximations
- Linear system equations - Gauss elimination method, Gauss Seidal iteration method, Gauss - Jorden method.
- Numerical integration rule - trapezoidal, Simpson
- Eigen values matrix - power method
- Ordinary differential equations solution methods - Euler, Runge- Kutta , Milne
- Laplace equation solution

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

ET260U POWER ELECTRONICS LAB

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

COURSE DESCRIPTION

This course deal with the practical exposure to fundamentals of power semiconductor devices, construction, working principles, their ratings, characteristics, performance and application of power converters like AC to DC, DC to DC, DC to AC and AC to AC

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET255U Power Electronics

COURSE OBJECTIVES

The objectives of offering this course are to impart necessary and sufficient practical exposure of devices and circuits used in the area of

1. power electronic circuit topology
2. component ratings and their selection
3. power converters analog and digital communication

COURSE OUTCOMES

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

1. recognize the construction, working principle, characteristics of semiconductor devices.
2. identify ratings of ordinary and power semiconductor devices and their applications.
3. demonstrate and perform the experiment on power electronics converters

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	2	3
2	3	2	2										1	3	2
3	3	2	2										2	2	3

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

COURSE CONTENT

Minimum ten experiments shall be performed to cover entire curriculum of course ET255U. For simulation, MatLab, SciLab, Proteus, PSpice, PSim, etc. one of the available tool may be used. Following list of experiments is just a guideline.

- SCR, TRIAC, IGBT V-I characteristics
- SCR/TRIAC/GTO - triggering methods

- Converter - single phase half wave and full wave
- Converter - single phase half controlled (semi-converter)
- Chopper - step up, step down
- Inverter – series, parallel
- Converter- single phase AC to AC
- Simulation - AC to DC, DC to DC, DC to AC, AC to AC converters

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).

SH250AU INTRODUCTION TO THE CONSTITUTION OF INDIA

Teaching Scheme : 00L **Credit : 00**
Evaluation Scheme : 60 ESE **Total Marks : 60**

COURSE DESCRIPTION

The course provides knowledge about constitution of India, state and central policies, fundamental rights, fundamental duties, powers and functions of municipalities, panchayats and co-operative societies, electoral process and judiciary system.

DESIRABLE AWARENESS

Basic knowledge of Indian Constitution

COURSE OBJECTIVES

The objectives of the course are to

1. provide knowledge about legal literacy, state and central policies, fundamental rights, fundamental duties, powers and functions of municipalities, panchayats and co-operative societies, electoral process
2. enable the students to take up competitive examinations and also demonstrate the qualities of a responsible citizen.

COURSE OUTCOMES

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

1. understand and remember the knowledge of basic information about Indian constitution.
2. analyse individual role and ethical responsibility towards society.
3. apply the knowledge of human rights and its implications while behaving with other citizens.

RELEVANCE OF POS AND STRENGTH OF CORRELATION

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

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

COURSE CONTENT

Introduction to the Constitution of India

the making of the constitution and salient features of the constitution., preamble to the constitution, fundamental rights and its limitations. Directive principles of state policy and relevance of directive principles, state policy fundamental duties, union executives – resident, prime minister, parliament, supreme court

State Executives

governor, chief minister, state legislature, high courts of state, electoral process in India, procedures for amendment in constitution

Human Rights

meaning and definitions, emergency provisions, working of national human rights commission in India, powers and functions of municipalities, panchyats and cooperative societies

Text Books

1. Introduction to the Constitution of India, (Students Edn.) Durga Das Basu, Prentice – Hall EEE, 19th / 20th Edition, 2001
2. Introduction to the Constitution of India", Brij Kishore Sharma, PHI Learning Pvt. Ltd., New Delhi, 2011

Reference Books

1. An Introduction to Constitution of India, M.V.Pylee, Vikas Publishing, 2002
2. Constitution of India, Dr. B. R. Ambedkar, Government of India Publication
3. Latest Publications of Indian Institute of Human Rights, New Delhi