Title of the Course: ENGINEERING MATHEMATICS-III Course Code: UETC0301	L	T	P	Credits
	3	1	---	4

Course Pre-Requisite: Basic terminologies of differential equations, concepts of probability, rules and formulae of derivative and integration.

Course Description: This Course contains linear differential equations, Laplace transforms probability distributions, Fourier series, Fourier Transforms, Z Transform .

Course Objectives:

1. To develop abstract, logical and critical thinking and the ability to reflect critically upon their work.
2. To study various mathematical tools like differential equations, integral transforms, probability to devise engineering solutions for problems arising in engineering.
3. The student must be able to formulate a mathematical model of a real life and engineering problem, solve and interpret the solution in real world.

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive level	Descriptor
CO1	Understand the concept of differential equation, probability distribution, integral transform and properties of integral transform	II	Understand
CO2	Solve the problems on differential equation and Fourier series.	III	Solve
CO3	Apply the knowledge of integral transform and use its properties to obtain solution of various problems.	III	Apply
CO4	Use the knowledge of probability distribution to solve the real life problems.	III	Use

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2						1						
CO2	3	2						1						
CO3	3	2						1						
CO4	3	2						1						

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three units)

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three units) covered after MSE.

Course Contents:

Unit 1: Linear Differential Equations with Constant Coefficients and Its Applications 1.1 Definition, general form, complete solution 1.2 Rules for finding complementary function 1.3 Short methods for finding particular integral 1.4 General rule for finding particular integral 1.5 Applications to electrical circuits	6 **Hrs.**
Unit 2: Laplace Transforms 2.1 Definition, transforms of elementary functions, properties of Laplace transform 2.2 Transforms of derivative and integral 2.3 Inverse Laplace transforms 2.4 Inverse Laplace transforms by using partial fractions and convolution theorem. 2.5 Transforms of periodic functions and Heaviside unit step function. 2.6 Solution of linear differential equations with constant coefficients by Laplace transform method	7 **Hrs.**
Unit 3: Fourier Series 3.1 Definition, Euler's formulae, 3.2 Dirichlet's conditions, functions having points of discontinuity. 3.3 Change of interval 3.4 Expansion of odd and even periodic functions 3.5 Half range series	8 **Hrs.**
Unit 4: Fourier Transform 4.1 Fourier integral theorem 4.2 Fourier transforms 4.3 Fourier sine and cosine transforms 4.4 Finite Fourier sine and cosine transforms 4.5 Properties of Fourier transforms 4.6 Convolution theorem for Fourier transform 4.7 Parseval's identity for Fourier transform	8 **Hrs.**
Unit 5: Z Transform 5.1 Definition, convergence of Z transforms, some standard Z Transforms 5.2 Properties of Z transforms. 5.3 Inverse Z transforms. 5.4 Inverse Z transforms using Power series method and partial fraction method. 5.5 Application to difference equations.	7 **Hrs.**
Unit 6: Probability Distributions 6.1 Random variable 6.2 Probability mass function and probability density function 6.3 Binomial distribution 6.4 Poisson distribution 6.5 Normal distribution	6 **Hrs.**
Recommended Books: 1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi. 2. A Text Book of Applied Mathematics, Vol. I, Vol. II and vol. III by P. N. Wartikar & J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune.	

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.
4. Mathematics for Engineers Vol-I &Vol-II by RakeshDube, Narosa Publishing House.

Unit wise Measurable Learning Outcomes:

Unit 1: Linear Differential Equations with Constant Coefficients and Its Applications

Students will be able to

a) Solve linear differential equations with constant coefficients.
b) Solve the problems on **electrical circuits.**

Unit 2: Laplace Transforms

Students will be able to

a) Find Laplace transform by using definition
b) Recall properties of Laplace transform and use to find transforms of given functions.
c) Use Laplace transform method to solve linear differential equations.

Unit 3 : Fourier Series

Students will be able to

a) Define Fourier series, Euler's formulae.
b) Develop Fourier series in an interval.
c) Expand function as the half range sine or half range cosine series

Unit 4: Fourier Transforms

Students will be able to

a) Find Fourier transforms of various functions
b) Find Fourier sine and cosine transforms of given functions

Unit 5: Z Transforms

Students will be able to

a) Find Z transforms of various functions
b) Find inverse Z transforms of given functions

Unit 6: Probability Distributions

Students will be able to

a) Verify the function as probability mass and density function.
b) Use probability distributionsin solving physical and engineering problems

Title of the Course: Analog Circuits - I	L	T	P	Credit
Course Code: UETC0302	3	-	-	3

Course Pre-Requisite:
Basic knowledge of mathematics, semiconductor physics will be beneficial

Course Description: This course has been designed to introduce students with construction, theory and characteristics of various electronics devices. Also this course will lay strong fundamental base of discrete electronics and to develop capacity to analyze, interpret and design different electronics circuits.

Course Objectives:
1. To **explain** the working of electronic circuits like diodes and amplifiers using BJT
2. To **explain** the operation of transistor and its different configurations
3. To **explain** the small signal models used for performance analysis of electronic circuits.
4. To **illustrate** the methods of designing the electronic circuits using discrete components.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	**Analyze** the performance of electronic circuits (like amplifiers, feedback amplifiers) using small signal models such as hybrid-parameter model.	IV	Analyze
CO2	**Evaluate** the performance of rectifiers, filters, wave shaping, power amplifiers, feedback amplifiers.	V	Evaluate
CO3	**Design** the electronic circuits (rectifiers, filters, wave shaping circuits and power amplifiers) for given specifications using discrete components such as diode and BJT	VI	Design
CO4	**Select** appropriate power amplifiers, feedback amplifiers, wave shaping & Voltage Regulators for given application.	III	Select

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2											1	
CO2		2	3	2									1	
CO3		2	3	2									1	
CO4		1			2								1	

Assessments :
Teacher Assessment:
Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1:---DIODE APPLICATIONS:	07 Hrs.

P-N junction Diode applications-Rectifiers (Half wave, full wave: center tap and bridge type, parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc.); Filters: Need of Filters, Types of Filters: Capacitor, Inductor, LC filters, Analysis of above Filters for ripple factor & Regulation. Design of unregulated power supply using FWR with all types of filters	
Unit 2:---Wave Shaping Circuits **Clipping circuits:-**Classification, diode clippers, transistor clippers, Transfer characteristics, Design & analysis of clipper circuits. **Clamping circuits:-** Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, **Voltage multipliers:-**Doubbler, Tripler & Qudrappler circuits.	**06 Hrs.**
Unit 3:--BIPOLAR TRANSISTORS: NPN Transistor, PNP Transistor, IV characteristics, Charge storage and transient response, Load line concept, Current voltage characteristics, Transistor Configurations(CE,CB & CC configuration), Biasing (fixed bias, collector to base bias & voltage divider bias) and stability factor for all biasing circuits.	**07 Hrs.**
Unit 4:---BIPOLAR TRANSISTOR'S SMALL SIGNAL MODELS : H-Parameters, Hybrid model for transistor (CE, CB&CC configuration), analysis of amplifier for Voltage gain, Current Gain, Input Resistance and Output Resistance in terms of h-parameters**.** Evaluation of Ri, Ro, Ai, Av, RC coupled amplifier, Types of coupling, RC coupled, Transformer coupled, Direct coupled amplifier	**07 Hrs.**
Unit 5:---BJT AMPLIFIERS: Classification of amplifiers, Need of Cascading frequency response of cascade amplifier, Feedback Amplifier: Classification of feedback amplifier(voltage Series ,Current series, voltage shunt, current shunt feedback amplifiers), Study of emitter Follower, Darlington amplifier with bootstrapping principle, two stage, RC coupled amplifier with feedback.	**07 Hrs.**
Unit 6:---POWER AMPLIFIERS: Need of power amplifiers, Classification of power amplifier: Class A, Class B, Class C, Class AB, concept of Cross over distortion, methods to eliminate Cross over distortion, Complimentary symmetry amplifiers	**06 Hrs.**
Textbooks: 1. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshiscitech Publication. 2. Electronic Devices and Circuits by Allen Mottershead-PHI 3. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj TMH Publication 4. A.S. Sedra and K.C. Smith, Microelectronic Circuits Saunder's College Publishing, 1991.	
References: 1. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication. 2. Electronic Devices and Circuits by J.B.Gupta,Katson Publication 3. Electronic Devices and Circuits by Millman, Halkias, TMH Publication. 4. Pulse, Digital & Switching Waveforms by Millman, Taub, Rao. 5. Schaum's Outlines, ― Electronic Devices and Circuits‖ 6. Electronic Devices and Circuits by Mantri & Jain, Nikita Publication.	
Unit wise Measurable students Learning Outcomes: 1. To **understand** the working of transistors and its configurations 2. **Apply** the small signal models (tools) to **analyze** the performance of amplifiers built using BJT. 3. **Analyze** the performance of rectifiers and BJT amplifiers. 4. **Analyze** and **Design** BJT amplifiers.	

Title of the Course: Digital Systems Course Code:UETC0303	L	T	P	Credit
	3	--	--	3

Course Pre-Requisite: Basic knowledge of numbering system and logic gates.

Course Description:
It is a core and fundamental subject. The course focuses on basic skills in method of design and analysis of digital system like counters, registers,FSM etc.

Course Objectives: The course aims to:
1. Explain Boolean algebra and the various methods of Boolean function reduction, K-map reduction.
2. Understand principles, characteristics and operations of combinational & sequential logic circuits.
3. Design, implement and analyze combinational & sequential circuits (FSM) using logic gates and flip flops.
4. Understand principles, characteristics and operations of Logic families and semiconductor memories.

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	Apply Boolean laws/K-Map-method to reduce a given Boolean function.	III	Apply
CO2	Design & realize combinational and Sequential logic circuits.	III	Design
CO3	Design & realize Synchronous sequential machine using Moore and Mealy machine.	VI	Design
CO4	Demonstrate the operations of sequential circuits, logic families and semiconductor memories.	II	Demonstrate

CO-PO Mapping:

CO's/PO's	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2	3							2	1	1	1	
CO2	2	2	3	3	1					2	1	1	2	
CO3	2	2	3	3	1					2	1	1	1	
CO4	2	2	3							2	1	1	2	

Assessments:
Teacher Assessment:
Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Unit 1:-Boolean Logic Simplification. Review of Boolean Algebra and De Morgan's Theorem, SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, logic reduction using Boolean algebra and K-map method**.**	**6 Hrs.**
Unit 2:-Combinational Logic Design. Adder, Subtractor, code converters (binary to gray & gray to binary, BCD to Excess 3 and vice	**7 Hrs.**

versa, BCD to 7 segment display)(IC 7447, 7448), Multiplexer and Demultiplexer, encoder, priority encoder, decoder, adder with look ahead carry generator, Subtractor using adder, 4 bit Magnitude Comparator , Design of barrel shifter, Static and dynamic Hazards.	
Unit 3:-Sequential Logic Circuits. SR latch, Gated latch, Edge triggered flip-flop:- D, JK, master slave JK flip flop, T Flip-flop, flip flop asynchronous inputs, characteristic table of Flip-flop, excitation table of Flip-flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop: clock to Q, setup time, hold time.	**6 Hrs.**
Unit 4:-Applications of Sequential circuits. Shit resistor: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift resistor universal shift resistor. Counter: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Ring counter, Johnson counter.	**7 Hrs.**
Unit 5: - Synchronous Sequential Machines. FSM, Moore/Mealy machines, representation techniques, state diagram, state table, state assignment and state reduction, implementation using flip flops. Design of synchronous counters, Mod-n counters.	**5 Hrs.**
Unit 6:- Integrated circuit, Logic Families and Semiconductor Memories: Study of Logic families: TTL, CMOS, Comparison of TTL and CMOS families. Static and dynamic Characteristic of TTL NAND gate, Voltage and current Specifications, Noise margin, fan-in, fan-out, Propagation delay, Tristate logic, interfacing of logic families (TTL, CMOS) with others. Memory Devices: ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM. Flash ROM.	**7 Hrs.**
Textbooks: 1. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI 2. M. Morris Mano 'Digital Design'-- (Third Edition),. PHI 3. Digital systems : principles and applications / Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss.—10th ed., Pearson Education, Inc.	
References: 1] William I. Fletcher.'An Engineering Approach to Digital Design'—PHI/ Pearson 2] Norman BalabanianBradle Carlson. 'Digital Logic Design Principles,' Wiley Publication.	
Unit wise Measurable Students Learning Outcomes: Upon successful completion of this course students will be able to: 1. Explain various Boolean laws and its reduction technique. 2. Understand principles, characteristics and operations of combinational logic circuits. 3. Understand principles, characteristics and operations of sequential logic circuits. 4. Design & realize combinational and Sequential logic circuits. 5. Design, realize and Analyze Synchronous sequential machine using Moore and Mealy machine. 6. Explain the operations of logic families and memories.	

Title of the Course: Network Analysis	L	T	P	Credit
Course Code: UETC0304	3	1	-	4

Course Pre-Requisite: Basic knowledge of Electrical Engineering like KCL, KVL, Cramer's Rule, Laplace Transform.

Course Description: This course deals with circuit and graph theory. Detail concept of Resonance and Two Ports Network. Also it discusses design of different Filters and Attenuators. Course ends with Transient Analysis.

Course Objectives:

The course aims to:

1) Study various types of network theorems for network analysis and graph theory.
2) Study and classify 2-port network parameters and to understand concept of frequency domain, pole-zero and network stability issues.
3) Analyze different resonance circuits.
4) Distinguish different types of transient systems.
5) Design passive Filters and Attenuators.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Illustrate basic AC DC independent dependent voltage sources current sources and analyze the R-L-C circuits using network theorems and graph theory.	II	Illustrate
CO2	Determine two port network parameters viz Z, Y, ABCD, H and their interrelationships and network functions.	V	Determine
CO3	Evaluate series resonance and parallel resonance frequency half power frequencies BW Q factor etc.	V	Evaluate
CO4	Identify the type of transient system.	III	Identify
CO5	Analyze Constant K, m-derived filters and Attenuators.	IV	Analyze

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3								1		1	2	
CO2	1	3								1		1	1	
CO3	1	3								1		1	1	
CO4	1	3	2							1		1	1	
CO5	1	3	2							1		1	1	

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:	
Unit 1: ---Development of Basic Circuit Concepts And Graph Theory: Conventions for describing networks, network Equations, Kirchhoff 's Law, source transformations, Lumped Circuit elements, Ideal Sources (Dependent & Independent), Linear Passive elements relationship of Circuit elements- Definitions: Node, Loop, Path & Branch, source transformation, star-delta transformation, loop analysis, node analysis, Super mesh and super node analysis. (Examples – Kirchhoff's Laws and Application, formulations of networks, loop analysis, node analysis (Both AC & DC). **Graph Theory:** Graph of a network, Trees, chords and branches, Incidence matrix, loop matrix, Tie-set and cutest of a graph.	**6 Hrs.**
Unit 2: --- Network **Theorems: (Both DC & AC Circuit Analysis) :** Superposition Theorem, Millman's Theorem, Norton's Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem, Duality Theorem, Miller's Theorem and Compensation Theorem.	**8 Hrs.**
Unit 3: --Two Port Network & Network Functions: Two port Network: Relationship of Two-port variables, short-circuit admittance parameters, the open circuit impedance parameters, transmission parameters, the hybrid parameters, relationships between parameters sets, parallel and series connections of two-port network. Network Function: Transfer functions of two port network, Poles and Zeros of network function, time domain response from pole zero plot, amplitude and phase response from pole zero plot.	**6 Hrs.**
Unit 4: --- Resonance: Introduction to AC circuit, steady state analysis of RL, RC and RLC circuits, Impedance, phasor diagrams, power and power factor, Series resonance: Bandwidth Q factor. Parallel resonance: Bandwidth, Q factor. Tank circuit.	**6 Hrs.**
Unit 5: --- Filtersand Attenuators. Introduction, Classification, filter fundamental such as attenuation constant (O), phase shift (N) propagation constant (S) characteristic impedance (Zo), Design of T, π and Lattice type Attenuators .Design of Low pass, High pass, Band pass & Band reject filter, Design & analysis of constant K, M derived & composite filters (low pass, high pass, band pass & band stop filters).	**6 Hrs.**
Unit 6: --- Transient Response: Network Solution using Laplace transforms, Initial Conditions of elements. Steady state & transient response (Voltage) DC response of RL circuit. DC response of RC circuit. DC response of RLC circuit. Sinusoidal response of RL, RC & RLC circuit.	**4 Hrs.**
Note for Paper Setter: 50 % weightage for Numerical Questions and 50 % weightage for Theory Questions.	

Textbooks:

1) A. Sudhakar ,ShyammohanS.Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication (Unit II,IV,VI)
2) A.Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition (Unit I,II) Dhanpat Rai & co
3) D. Roy Choudhury 'Networks & Systems' - New Age International Publisher (Unit I,II,III)

4) Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai & Co. (Unit III,IV,V,VI)
5) Boylestad 'Introductory Circuit Analysis – Universal book stall, New Delhi.(Unit I,II).

References:

1) William H Hayt, Jack E Kimmerly and Steven M.Durbin, Engineering Circuit Analysis, Tata McGraw Hill
2) M.E.VanValkenburg ' Network Analysis' – IIIrd Edition , Pearson Education / PHI
3) JoshephEdministrar 'Theory & Problems of Electronic Circuit (Schaum's series) Tata McGraw Hill, Publication
4) R.G .Kaduskar, S.O.Rajankar, T.S. Khatavkar, Network Fundamentals and Analysis – Wiley India.

Unit wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to

1) Explain the graph theory and analyze the circuit using graph theory.

2) Solve problems related to different theorems used for network analysis.

3) Demonstrate two port networks and its parameters.

4) Explain series and parallel resonance and its effects.

5)Apply and implement filters and Attenuators.

6) Identify and study the type of transient system.

Title of the Course: Electronic Instrumentation & Measurement Course Code:UETC0305	L	T	P	Credit
	03	-	-	03

Course Pre-Requisite: Fundamentals of physics, semiconductor physics, basics of electronic devices.

Course Description: The course aims to provide knowledge of different parts of Measurement system, instrumentation system & different types of transducers.

Course Objectives:

This course aims to

1. Understand measurement systems performance and characteristics.
2. Provide introduction of different types of Transducers & sensors.
3. Understand the measuring methods and instruments of electrical quantities.
4. Learn the construction and working principle of measuring instrument and their applications.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's level	Descriptor
CO1	Calculate performance and characteristics of measurement system.	III	Calculate
CO2	Select appropriate transducer as per applications.	I	Select
CO3	Apply their knowledge to measure electrical quantities using analog and digital measuring instruments.	III	Apply
CO4	Explain operation of different instruments and Identify their industrial and laboratory applications	II	Explain

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2		1	2							2	2	1
CO2	3	1	3	2	2		1		2	2	2	2	2	1
CO3	3			1	3				2	1	1	2	2	
CO4	3	2	1	2	2		2		2		1	2	2	1

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: - Measurement systems performance and characteristics: Introduction of measurement system, Performance Characteristics, Static Characteristics, Error in Measurement, Types of Static Error, Sources of Error, Dynamic Characteristics, Statistical Analysis, Electrical Standards	6 Hrs.
Unit 2: - Bridges: DC Bridges- Introduction, Wheatstone bridge, Kelvin's bridge. AC Bridges- Introduction, measurement of inductance-Maxwell's bridge, Hay's bridge, Andersons bridge, measurement of capacitance- Schering bridge, wein bridge, Application of bridges	5 Hrs.
Unit 3:-Transducers and sensors Definition, Types of Transducers, Classification of Transducers, Selection Factors and General Applications of Transducers, Study of Transducers: Motion LVDT, Flow, Pressure, Temperature, Force: Load cell, strain gauge, application of all above sensors	6 Hrs.
Unit 4: - Semiconductor Sensors: MEMS sensors, Digitalsensors, Proximity sensors, optical Sensors, Piezo – electric sensors, Hall Effect sensor, environment sensor, application of all above sensors	7 Hrs
Unit 5: -Digital measurements systems Sample and hold circuit, dual slope integrating type ADC, successive approximation type ADC, introduction to flash type ADC, High resolution ADCs, DAC, Digital multi-meter, Digital frequency meter, Display technologies: LED, LCD and interfacing techniques	7 Hrs.
Unit 6: - Measuring Instruments DSO block diagram, Measurement of Voltage phase and frequency, Frequency spectrum, mathematical functions, triggering types, DSO probes: active, passive, current, attenuators, function generator, harmonic distortion analyzer, spectrum analyzer,Mixed Signal Oscilloscope (MSO)	5Hrs

Textbooks:

1. Industrial control Electronics Applications and designs: J Michael Jacob, Prentice hall international edition.
2. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009.
3. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill.
4. Instrumentation: Devices and Systems Rangan, Sharma.
5. Digital Instrumentation by A. J.Bouwens,McGraw Hill Education India.
6. Electronic Measurements and Instrumentation Bernard M. Oliver, John M. Cage McGraw Hill Education.

References:

1. Electronic Instrumentation and Measurement Techniques, Helfrick Cooper.
2. Instrumentation for Engineers and Scientists, John Turner, II Edition, Wiley.
3. Electronic Instrumentation and Measurements, David A Bell, Third Edition, Oxford.
4. Instrumentation for Engineering Measurements, James W Dally, II Edition, Wiley.
5. Analog devices, National Semiconductor, ST Micro, Vishay semiconductor datasheets and application notes.

Unit wise Measurable Students Learning Outcomes:

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

1. Identify and classify error sources and explain how their effects can be minimized in Measurement.
2. Design bridge circuits to calculate unknown values of R, L and C.
3. Understand principle of operation of transducers & its selection factors for various applications.
4. Apply knowledge of sensors according to requirement.
5. Explain operating principle of measurement systems.
6. Use Measuring Instruments to determine electrical parameters of signal.

Title of the Course: Analog Circuits-I Lab	L	T	P	Credit
Course Code:UETC0306	-	-	2	1

Course Pre-Requisite: Basic Electrical Engineering

Course Description:
This course provides students, the fundamental concepts of Electronic Devices their analysis and various circuit applications.

Course Objectives:
1. To construct simple electronic circuits to accomplish specific function.
2. Testing of circuits developed in lab.
3. Evaluate performance of experiment studied.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	Analyze circuits(rectifiers, wave shaping circuits, and amplifiers) to meet requirements.	IV	Analyze
CO2	Design circuits (rectifiers, wave shaping circuits, and amplifiers) to meet requirements.	VI	Design
CO3	Build circuits (rectifiers, wave shaping circuits, and amplifiers) to meet requirements.	III	Build
CO4	Evaluate circuits (rectifiers, wave shaping circuits, and amplifiers) performance parameters.	V	Evaluate
CO5	Interpret results of experiment and compare with standard value.	V	Interpret

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2											1	
CO2		2	3	2									1	
CO3		2	3	2									1	
CO4		1			2								1	
CO5		2	1	1										

Assessments :
Teacher Assessment:
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1:--- **2Hrs.**
Aim and Objectives:
Design & analysis of Half wave rectifier (HWR) with & without filter by calculating performance parameters
Outcomes: Student will be able to design unregulated power supply

Theoretical Background: Rectifiers and filters **Experimentation:** Performing of Half wave rectifier (HWR) with & without filter **Results and Discussions:** Comparison between Practical & Theatrical analysis results **Conclusion:**	
Experiment No. 2:--- **Aim and Objectives:** Design & analysis of Full wave rectifier with & without filter by calculating performance parameters **Outcomes:** Student will be able to design unregulated power supply **Theoretical Background:** Rectifiers and filters **Experimentation:** Performing of Full wave rectifier with & without filter **Results and Discussions:** Comparison between Practical & Theatrical analysis results **Conclusion:**	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:** Study of different clipper circuits **Outcomes:** Student will be able to understand operation of various clipper circuits **Theoretical Background:** Clipper circuits **Experimentation:** Obtain input output transfer characteristics of different clippers circuit **Results and Discussions:** **Conclusion:**	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:** Study of different clamper circuits: positive, negative & bias **Outcomes:** Student will be able to understand operation of various clamper circuits **Theoretical Background:** Clamper circuits **Experimentation:** Obtain input output transfer characteristics of different clamper circuit **Results and Discussions:** **Conclusion:**	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives:** Design & analysis of Voltage divider biasing circuit. **Outcomes:** Student will be able to design Voltage divider biasing circuit **Theoretical Background:** Transistor biasing **Experimentation:** Analysis of Voltage divider biasing circuit **Results and Discussions:** Comparison between Practical & Theatrical analysis results **Conclusion:**	2**Hrs.**
Experiment No. 6:--- **Aim and Objectives:** Determination of H-parameters from transistor CE characteristics. **Outcomes:** Student will be able to determine **Theoretical Background:** **Experimentation:** **Results and Discussions:** Comparison between Practical & Theatrical analysis results **Conclusion:**	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives:** Calculation of performance parameters (Av, Ai, Ri, Ro) for single stage RC coupled amplifier. **Outcomes:** Student will be able to calculate for single stage RC coupled amplifier. **Theoretical Background**: Generalize theory of Av, Ai, Ri, Ro **Experimentation:** Obtaining performance parameter for single stage RC coupled amplifier **Results and Discussions:** **Conclusion:**	2**Hrs.**
Experiment No. 8:--- **Aim and Objectives:** Design and study of single stage RC coupled amplifier. **Outcomes:** Student will be able to design single stage RC coupled amplifier and understand the	2**Hrs.**

frequency response of amplifier. **Theoretical Background:** single stage RC coupled amplifier. **Experimentation:** Design and **o**btain Frequency response of single stage RC coupled amplifier. **Results and Discussions:** Obtain the bandwidth of RC coupled amplifier **Conclusion:**	
Experiment No.9 :--- **Aim and Objectives:** Design & study of Frequency response of two stage RC coupled amplifiers. **Outcomes:** Student will be able to design two stage RC coupled amplifier and understand the frequency response of amplifier. **Theoretical Background:** RC coupled Multistage amplifier **Experimentation:** Design and **o**btain Frequency response of two stage RC coupled amplifier. **Results and Discussions:** Obtain the bandwidth of RC coupled amplifier **Conclusion:**	2**Hrs.**
Experiment No. 10:--- **Aim and Objectives:** Design & study of Frequency response of two stage direct coupled amplifiers. **Outcomes:** Student will be able to design two stage direct coupled amplifier and understand frequency response of amplifier. **Theoretical Background:** Two stage direct coupled amplifiers **Experimentation:** Design and **o**btain Frequency response of two stage direct coupled amplifier **Results and Discussions:** Obtain the bandwidth of amplifier and effect of direct coupling **Conclusion:**	2**Hrs.**
Experiment No. 11:--- **Aim and Objectives:** Design and analysis of current series feedback amplifiers **Outcomes:** Student will be able to understand effect feedback on amplifier **Theoretical Background:** Current series feedback amplifiers **Experimentation:** Observe the performance of amplifier with and without feedback **Results and Discussions:** Obtain the bandwidth with and without feedback **Conclusion:**	2**Hrs.**
Experiment No. 12:--- **Aim and Objectives:** Study of power amplifiers **Outcomes:** Student will be able to understand various power amplifiers **Theoretical Background:** Power amplifiers **Experimentation:** Analyze the performance of various power amplifiers **Results and Discussions:** Comparison between various power amplifiers **Conclusion:**	2**Hrs.**
Textbooks: 1. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshiscitech Publication. 2. Electronic Devices and Circuits by Allen Mottershead-PHI 3. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj TMH Publication 4. A.S. Sedra and K.C. Smith, Microelectronic Circuits Saunder‘s College Publishing, 1991.	
References: 1. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication. 2. Electronic Devices and Circuits by J.B.Gupta,Katson Publication 3. Electronic Devices and Circuits by Millman, Halkias, TMH Publication. 4. Pulse, Digital & Switching Waveforms by Millman, Taub, Rao. 5. Schaum's Outlines, ― Electronic Devices and Circuits‖ 6. Electronic Devices and Circuits by Mantri & Jain, Nikita Publication.	
Experiment wise Measurable students Learning Outcomes: **1. Compare and contrast** the amplifier circuits implemented using BJT. 2. **Analyze** the performance of rectifiers, filters and wave shaping circuits.	

Title of the Course: Digital System Lab	L	T	P	Credit
Course Code:UETC0307	--	--	2	1

Course Pre-Requisite: There are no pre-Requisite for this course, however the knowledge of numbering system and working of basic gates will be beneficial.

Course Description: This course focuses on designing of combinational and sequential circuits.

Course Objectives: This course aims to

1. Understand the basic characteristics Logic families (TTL/CMOS)
2. Understand the operation of combinational and sequential circuits and its applications.
3. Demonstrate the operation of sequential circuits.
4. Design and analyze different types of combinational and sequential circuits.
5. Demonstrate the operation of Finite state machines.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive level	Descriptor
CO1	Design & Construct sequential and combinational logic circuits.	VI	Design
CO2	Design & construct synchronous sequential machine using Moore and Mealy machine.	VI	Design
CO3	Demonstrate the operation of sequential logic circuits, logic families and semiconductor memories.	II	Demonstrate

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2	3	2	1		1		1	1	1	1	2	
CO2	3	2	3	2	1		1		1	1	1	1	2	
CO3	2	2	3	2	1		1		1	1	1	1	1	

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	**Marks**
ISE	25
ESE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

ESE: Assessment is based on oral examination

Course Contents:

Experiment :- Determination of static characteristics a. Input and output characteristics of inverter (TTL, LSTTL, CMOS) b. Measurement of CMOS propagation delay with different supply voltages	**4Hrs.**
Experiment :- Combinational Logic Circuits (Any Two) a. Adder/ Subtractor b. Code Converters c. Logic implementation of three input minterm/maxterm d. MUX/DMUX	**4Hrs.**
Experiment :- Sequential Logic Circuits (Any Two) a. Design and implement S-R flip-flop and D flip-flop and JK flip-flop using logic gates. b. Conversion of Flip-flops. c. Shift Registers.	**4Hrs.**

Experiment :- Design and implementation of Counters (Any Two) a. Ripple Counter b. Mod-n Counter synchronous c. Johnson Counter d. Cascaded counters.	**4Hrs.**
Experiment :- Design and implement FSM a. Sequence detector using Moore Machine b. Sequence detector using Mealy Machine	**4Hrs.**
Experiment :- Mini Project Fairly complex application oriented mini-project with digital input and output and appropriate display.	
Textbooks: 1. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI 2. M. Morris Mano 'Digital Design'-- (Third Edition),. PHI	
References: 1] William I. Fletcher.'An Engineering Approach to Digital Design'—PHI/ Pearson 2] Norman BalabanianBradle Carlson. 'Digital Logic Design Principals,.' Wiley Publication. 3] Rajkamal 'Digital Systems Principals and Design'—Pearson 4] A.P. Malvino, D.P. Leach 'Digital Principles & Applications' -VIth Edition-Tata McGraw Hill, Publication. 5] R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata McGraw Hill, Publication	

Title of the Course: Object Oriented Programming Course Code:UETC0309	L 1	T -	P -	Credit -

Course Pre-Requisite:
: A working knowledge of C programming is sufficient.

Course Description:
This course is an extension of courses exposing students to the many concepts of programming. The course is an expository of the object-oriented programming methodology with emphasis on software design and code reuse as its core objectives. As a practical course, the focus is to equip students with adequate high-level object-oriented programming techniques required for successful design, development, and deployment of today's complex software systems. Furthermore, the students are actually mentored to master how the C++ and Java technology can be used to develop modern software systems.

Course Objectives:

1. Understand fundamentals of object-oriented programming in C++ including defining classes, invoking methods, using classes.
2. Describe the meaning of the object-oriented paradigm, and create class hierarchies using the object-oriented design process.
3. Understand various features of OOP such as data abstraction, encapsulation, inheritance, dynamic binding, and Polymorphism.
4. Design and implement C++ programs for complex problems, making good use of the features of the language.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
1	Apply the basics of objective oriented programming concepts.	III	Apply
2	Develop simple OOPs using classes and objects.	VI	Develop
3	Construct programs using polymorphism and Inheritance	VI	Construct
4	Build programs using File Handling in C++.	II	Build

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2				2									1
CO2	2	2	3											1
CO3	2	2	3											1
CO4	2	2	3		1									1

Course Contents:	
Unit 1: --Introduction to OOP Object oriented programming [C++], applications of OOP & C++, dynamic initialization of variables, storage classes. Functions in C++, function prototype, call & return by reference, inline function, Default & Constant argument.	**2 Hrs.**
Unit 2: --Classes and objects Introduction, structures, classes, defining member function, making an outside function inline, Nesting member function, private member function, Arrays within a class, memory allocation for objects, Array of objects, pointer to members. Pointers to objects this Pointers.	**3 Hrs.**
Unit 3:-- Constructors and Destructors Constructors, parameterized and multiple, constructors with default arguments, Dynamic initialization of objects (new, delete) copy constructor, dynamic constructors and destructors.	**2 Hrs.**
Unit 4: -- Polymorphism Function overloading, Unary & binary operator overloading, manipulation of strings using operators. Friend function & friend class.	2 **Hrs**
Unit 5:--- Inheritance Single, multiple, multilevel, Hybrid, Hierarchical inheritance, virtual base classes, Abstract classes. Templates, exception handling.	3 **Hrs.**
Unit 6:--- File Handling Classes for file stream operations, opening and closing of files, file modes, file pointer & their manipulations, sequential I/O operations	2 **Hrs.**
Textbooks: 1.E Balgurusamy–'Object oriented programming with C++' -, IIIrd Edition- Tata Mc- Graw Hill Publication 2. Robert Lafore 'Object Oriented Programming in C++' The Waite Group	
References: 1. Schildt–'The Complete Reference C++' - IIIrd Edition - Tata McGraw Hill Publication 2. D Ravichandran.-'Programming with C++ '-IInd Edition- Tata McGraw Hill Publication 3. RohitKhurana-'Object oriented programming with C++'-second edition-Vikas publication 4. Rajesh K.Shukla-'Object – Oriented Programming in C++'WILEY,INDIA .	
Unit wise Measurable Students Learning Outcomes: 1. Explain the basics of objective oriented programming concepts. 2. Apply the features of object oriented programming such as objects, classes, user defined data types, enumerations, constructors, destructors, overloading, inheritance polymorphism etc. 3. Implement, test, and debug the programs in an object-oriented programming languages.(C++ and Java)	

Title of the Course: Object Oriented Programming Lab	L	T	P	Credit
Course Code: UETC0309	-	-	2	2

Course Pre-Requisite: A working knowledge of C programming is sufficient.

Course Description:

This course is an extension of courses exposing students to the many concepts of programming. The course is an expository of the object-oriented programming methodology with emphasis on software design and code reuse as its core objectives. As a practical course, the focus is to equip students with adequate high-level object-oriented programming techniques required for successful design, development, and deployment of today's complex software systems. Furthermore, the students are actually mentored to master how the C++ and Java technology can be used to develop modern software system.

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in C++ including defining classes, invoking methods, using classes.
3. Be aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Be able to use the C++ concepts and Java SDK environment to create, debug and run programs

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Apply the basics of objective oriented programming concepts.	III	Apply
CO2	Develop simple OOPs using classes and objects.	VI	Develop
CO3	Construct programs using polymorphism and Inheritance	VI	Construct
CO4	Build programs using File Handling in C++.	II	Build

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2				2									1
CO2	2	2	3											1
CO3	2	2	3											1
CO4	2	2	3		1									1

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1:--- Characteristics of Object Oriented Programming **Aim and Objectives:** To study concepts of Object oriented programming. **Outcomes:** After the completion of the experiments the student should be able to Explain the basics of objective oriented programming concepts. **Theoretical Background:** Basic knowledge of programming	2 **Hrs.**

Experiment No. 2:--- Classes and Objects **Aim and Objectives:** To study of classes and Objects. **Outcomes:** After the completion of the experiments the student should be able to write declaration of class and should explain types of defining functions in class.	2 **Hrs.**
Experiment No. 3:--- Constructor and Destructor **Aim and Objectives:** Constructor and destructor using C++ **Outcomes:** After the completion of the experiments the student should be able to explain syntax and types of different constructors and destructor.	2 **Hrs.**
Experiment No. 4:--- Operator and Function Overloading **Aim and Objectives:** C++ Program on Operator and Function Overloading **Outcomes:** After the completion of the experiments the student should be able to explain function and operator overloading.	2 **Hrs.**
Experiment No. 5:--- Swapping data using Friend Function **Aim and Objectives:** To swap data from two classes using Friend Function **Outcomes:** After the completion of the experiments the student should be able to explain definition and declaration of friend function.	2 **Hrs.**
Experiment No. 6:---Inheritance **Aim and Objectives:** C++ Program on single, multiple, multilevel and Hierarchical Inheritance. **Outcomes:** After the completion of the experiments the student should be able to explain importance and various types of Inheritance in OOP.	2 **Hrs.**
Experiment No. 7:---. Run Time Polymorphism **Aim and Objectives:**Implement Run Time Polymorphism using C++ **Outcomes:** After the completion of the experiments the student should be able to explain concept of Polymorphism.	2 **Hrs.**
Experiment No. 8:---Console I/O operation **Aim and Objectives:** C++ program for Console I/O Operation **Outcomes:** After the completion of the experiments the student should be able to explain concept of I/O Operations.	2 **Hrs.**
Experiment No. 9:---File Handling **Aim and Objectives:** C++ program on File handling. **Outcomes:** After the completion of the experiments the student should be able to explain concept of file handling in OOP.	2 **Hrs.**
Experiment No. 10:---Micro project **Aim and Objectives:** Micro project based on any engineering application. **Outcomes:** After the completion of the experiments the student should be able to design a software system using C++.	2 **Hrs.**
Textbooks: 1. E Balgurusamy–'Object oriented programming with C++' -, IIIrd Edition- Tata Mc- Graw Hill Publication 2. Robert Lafore 'Object Oriented Programming in C++' The Waite Group	
References: 1. Schildt–'The Complete Reference C++' - IIIrd Edition - Tata McGraw Hill Publication 2. D Ravichandran.-'Programming with C++ '-IInd Edition- Tata McGraw Hill Publication 3. RohitKhurana-'Object oriented programming with C++'-second edition-Vikas publication 4. Rajesh K.Shukla-'Object – Oriented Programming in C++'WILEY, INDIA .	

Title of the Course:Electronic Instrumentation & Measurement Lab	L	T	P	Credit
Course Code:UETC0308	0	0	2	1

Course Pre-Requisite: Fundamentals of physics, semiconductor physics, basics of electronic devices.

Course Description:
The course aims to provide knowledge of use of different parts of measurement system, instrumentation system & different types of transducers.

Course Objectives: This course aims to

1. Understand measurement systems performance and characteristics.
2. Provide introduction of different types of Transducers & sensors.
3. Understand the measuring methods and instruments of electrical quantities.
4. Learn the construction and working principle of measuring instrument and their applications.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Calculate performance and characteristics of measurement system.	III	Calculate
CO2	Select appropriate transducer as per applications.	I	Select
CO3	Apply their knowledge to measure electrical quantities using analog and digital measuring instruments.	III	Apply
CO4	Explain operation of different instruments and Identify their industrial and laboratory applications	II	Explain

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2		1	2							2	2	1
CO2	3	1	3	2	2		1		2	2	2	2	2	1
CO3	3			1	3				2	1	1	2	2	
CO4	3	2	1	2	2		2		2		1	2	2	1

Assessments :

Teacher Assessment:
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Experiment No. 1:--- **Aim and Objectives:** Study of weight measurement using strain gauge **Outcomes:** Students will be able to explain application of strain gauge for weight measurement **Theoretical Background:** Principle of operation of strain gauge **Experimentation:** Place unknown weight on load cell, note down corresponding reading displayed on digital meter. **Results and Discussions:** Measure the weight placed on load cell **Conclusion:** Strain gauge can be used as load cell for measure the unknown weights	2**Hrs.**
Experiment No. 2:--- **Aim and Objectives:** Study of temperature measurement using RTD **Outcomes:** students will be able to explain operation of RTD **Theoretical Background:** Principle of operation of RTD **Experimentation:** Immerse the RTD in boiling water & note down the temperature of water and corresponding resistance of RTD indicated on DPM. **Results and Discussions:** Plot a graph of temperature v/s Resistance of RTD. **Conclusion:** It is observed that as temperature increases resistance of RTD also increases.	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:** Study of speed measurement using proximity switch & photoelectric pick up. **Outcomes:** Students will be able to explain operation of proximity switch & photoelectric pick up for measurement of speed **Theoretical Background:** Operating principle of proximity switch and photo transistor **Experimentation:** Increase the speed of motor. Measure the speed by switching proximity switch and phototransistor. **Results and Discussions:** If speed of shaft is 1500 rpm this corresponds to 25 revolutions per second & hence frequency of pulse is 25 Hz or delay between successive pulses is 40 msec. This time period is measured & an average time period for successive pulse is calculated. Then a simple formula is used to calculate the gating period for digital counter. **Conclusion:** speed of motor can be found out by using proximity switch and phototransistor	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:** Study of DSO. **Outcomes:** Students will be able to use of DSO and its various knobs and to calculate electrical parameters of signal. **Theoretical Background:** Operating principle of DSO **Experimentation:** Display various signals on DSO using function generator. Measure the amplitude & frequency of the signal **Results and Discussions:** compare the actual & observed values of amplitude & frequency **Conclusion:** DSO can be used to observe o/p of various systems	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives:** Measurement of phase and frequency by lissajous pattern using DSO **Outcome:** Students will be able to determine frequency of unknown signal & phase difference between two signals **Theoretical Background:** Operating principle of DSO & function generator **Experimentation:** Lissajious figure is a stable pattern that is obtained by	2**Hrs.**

connecting known frequency to vertical input & varying the frequency of the known standard signal connected to the horizontal input of a dual oscilloscope activated in X-Y mode **Results and Discussions:** The unknown frequency is calculated using formula, FV = FH * (TH / TV) Phase angle θ = sin -1 YHY / YM. **Conclusion:** Thus we can measure frequency and phase by observing Lissajous pattern on DSO.	
Experiment No. 6:--- **Aim and Objectives :**Study of linear displacement measurement using linear potentiometer **Outcomes:** Students will be able to explain operation of potentiometer for displacement measurement **Theoretical Background:** Principle of operation of potentiometer**.** **Experimentation:** By moving the shaft, the resistance of potentiometer is changed. The displacement & corresponding resistance of potentiometer is indicated on DPM **Results and Discussions:** Observe displacement of shaft and resistance of potentiometer. **Conclusion:** The resistance of the potentiometer varies linearly with variation in displacement	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives :**Study of DC bridges **Outcomes:** Students will be able to calculate value of unknown resistance using DC bridge **Theoretical Background:** Principle of operation of DC bridges **Experimentation:** For a particular bridge values of resistors for different arms will be given. Students will have to calculate value of unknown resistor using bridge balance condition **Results and Discussions:** Calculate value of unknown resistor. **Conclusion:** DC bridges can be used to determine value of unknown resistor.	2**Hrs.**
Experiment No.8 :--- **Aim and Objectives:** Study of AC bridges **Outcomes:** Students will be able to calculate value of unknown resistance using AC bridge **Theoretical Background:** Principle of operation of AC bridges **Experimentation:** For a particular bridge values of resistors for different arms will be given. Students will have to calculate value of unknown resistor using bridge balance condition **Results and Discussions:** Calculate value of unknown resistor. **Conclusion:** AC bridges can be used to determine value of unknown resistor.	2**Hrs.**
Experiment No.9 :--- **Aim and Objectives:**LCD / sensor interfacing **Outcomes:** Students will be able to interface LCD/sensors to controller. **Theoretical Background:** Principle of operation and pin-out of LCD and sensors **Experimentation:** simulation/ hardware interfacing of LCD/sensor to controller. **Results and Discussions:** to observe status of LCD/ Sensor. **Conclusion:** Students can interface LCD/ sensors to controller.	2**Hrs.**

Experiment No. 10:- **Aim and Objectives:** Study of standards and specifications of any one industrial & Military sensor **Outcomes:** Students will be able to explain different standards and specification of industrial & Military sensors **Theoretical Background:** Study of standards and specifications of sensor. **Experimentation:** collection of standards and specifications of sensor from internet. **Results and Discussions:** able to select sensors according to the needs of the application. **Conclusion:** Students can describe different standards and specification of industrial & Military sensors.	2**Hrs.**
Experiment No.11 :--- **Aim and Objectives:** Study of MSO. **Outcomes:** Students will be able to use of MSO and its various knobs and to calculate electrical parameters of signal. **Theoretical Background:** Operating principle of MSO **Experimentation:** Display various signals on MSO using function generator. Measure the amplitude & frequency of the signal **Results and Discussions:** compare the actual & observed values of **amplitude**& frequency **Conclusion:** MSO can be used to observe o/p of various system	2**Hrs.**

Textbooks:

7. Industrial control Electronics Applications and designs: J Michael Jacob, Prentice hall international edition.
8. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009
9. A course in Electrical, Electronics measurement and Instrumentation, A.K. Sawhney
10. Electronic Instrumentation, H. S. Kalsi, MGH, 3rd Edition

References:

1. Electronic Instrumentation and Measurement Techniques, Welfrick Cooper.
2. Instrumentation for Engineers And Scientists , John Turner ,II Edition , Wiley
3. Electronic Instrumentation and Measurements, David A Bell, Third Edition, Oxford
4. Instrumentation for Engineering Measurements, James W Dally, II Edition , Wiley

Experiment wise Measurable students Learning Outcomes:

1. Students will be able to explain application of strain gauge for weight measurement.
2. Students will be able to explain operation of RTD.
3. Students will be able to explain operation of proximity switch & photoelectric pick up for measurement of speed.
4. Students will be able to use of DSO and its various knobs and to calculate electrical parameters of signal.
5. Students will be able to determine frequency of unknown signal & phase difference between two signals.
6. Students will be able to explain operation of potentiometer for displacement measurement.
7. Students will be able to calculate value of unknown resistance using DC Bridge.
8. Students will be able to calculate value of unknown resistance using AC Bridge.
9. Students will be able to interface LCD/sensors to controller.
10. Students will be able to explain different standards and specification of industrial & military sensors.

Title of the Course: Environmental Studies	**L**	**T**	**P**	**Credits**
Course Code:UETA0301	**2**	**-**	**-**	**-**

Course Pre-Requisite: Students shall have knowledge of:

- Science
- Technology

Course Description: The objective of the course is imparting fundamental knowledge and awareness of Environmental science among students and importance of conservation of environment.

Course Objectives:

At the end of the course students will be able to

1. Study scope and importance of natural resources, ecosystems, biodiversity for creating awareness and their conservation in multiple disciplines.
2. Learn various types of pollution, their impacts and control measures for minimizing pollution and sustainable development.
3. Understand social issues related environment, environmental ethics and human rights towards environment.
4. Study various laws and regulations related to environment and its applicability in society and industries

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines	2	Understanding
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.	2	Understanding
CO3	Discuss environmental ethics and their implementation for betterment of environment and human life.	4	Analyzing
CO4	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.	4	Analyzing

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							2							
CO2	3													
CO3								2						
CO4						2								

Assessment Scheme:

ESE: Assessment is based on 100% course content

Assessment Component	**Marks**
ESE	100

Course Contents:

Unit 1: Nature of Environmental Studies Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness.	4 **Hrs.**
Unit 2: Natural Resources and Associated Problems a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern	4 **Hrs.**

agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	
Unit 3: Ecosystems Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	4 **Hrs.**
Unit 4:Biodiversity and its conservation Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation, Western Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, manwildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	4 **Hrs.**
Unit 5:Environmental Pollution Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid	4 **Hrs.**
Unit 6: Social Issues and the Environment Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.	4 **Hrs.**
Unit 7:Environmental Protection From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights	4 **Hrs.**

Textbooks:

1. Environmental Studies by Dr. P.D.Raut (Shivaji University, Kolhapur)

Reference Books:

1. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
2. Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA,574p
3. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines,Compliances and Standards, vol. I and II, Environmental Media (R)

Title of the Course: Analog Circuits - II Course Code:UETC0401	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basic analog circuit -I

Course Description:
This course contains fundamentals of FET and MOSFET as amplifier. This course enables to students to analyze and design of basic application circuits such as oscillators, multivibrators, and voltage regulators by using discrete components like transistor and ICs.

Course Objectives:
1. To study FET, it's types, construction and working principle.
2. To understand various types of oscillator and multivibrators.
3. To understand working principle of various regulators and power supplies.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Cognitive level	Descriptor
CO1	Explain working of FET and MOSFET as amplifier	II	Explain
CO2	Analyze transistor applications as oscillator and multivibrator.	IV	Analyze
CO3	Design oscillators and multivibrators.	VI	Design
CO4	Explain working principle of various regulators and power supplies.	V	Explain

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2											1	
CO2		2	3	2									1	
CO3		2	3	2									1	
CO4		1			2								1	

Assessments :
Teacher Assessment:
Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1:-FET(Field Effect Transistor): JFET: Types, Construction, operation, V-I characteristics, Parameters of JFET, Biasing of JFET, analysis of Common Source Amplifier (CS) amplifier. MOSFET: Configuration, construction and operation of different MOSFET (NMOS, PMOS), Transfer Characteristics, Comparison of FET, BJT & MOSFET.	**07 Hrs.**
Unit 2: MOSFET AMPLIFIERS	**06 Hrs.**

Basic MOS device physics, MOS device model, single stage amplifier, Common source stage: restive load, Source follower.	
Unit 3:---Oscillators Barkhausens' Criteria, Frequency and amplitude Stability, classification of oscillator (RC Oscillators, LC Oscillators), Crystal Oscillator,.	**07 Hrs.**
Unit 4:---Multivibrators Classification of Multivibrators, Triggering Methods: Symmetrical and Unsymmetrical, Schmitt Trigger	**07 Hrs.**
Unit 5---Linear Power Supplies: Need of Voltage Regulator, Stabilization factor, Analysis of Shunt regulator (using Zener diode & BJT), Emitter follower regulator, series voltage regulator (using BJT), Series voltage regulator with Pre- regulator, Short circuit & Overload protection circuit. IC regulators: Study of regulators using 78XX & 79XX, LM317, IC 723.	**07 Hrs.**
Unit 6:--Switch Mode Power Supplies: Introduction of SMPS, comparison of SMPS with linear power supply, SMPS topologies, Step-down SMPS, Step -up SMPS, Polarity Inversion, Push-pull, etc, Detail study of LM3524.	**06 Hrs.**

Textbooks:

1. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj TMH Publication.
2. Electronic Devices and Circuits by Anil K. Maini, Varsha Agarwal- Wiley India.
3. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi, Pearson Publication.
4. Electronic Devices and Circuits by Allen Mottershead - PHI.

References:

1. Design of analog integrated circuits by BehzadRazavi, McGrawHill International edition
2. Schaum's Outlines, — Electronic Devices and Circuits‖
3. Electronic Devices and Circuits by Mantri& Jain, Nikita Publication.
4. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication.
5. Electronic Devices and Circuits by J.B.Gupta, Katson Publication
6. Electronic Devices and Circuits by Millman, Halkias, TMH Publication.
7. National Semiconductor Data Manual.

Unit wise Measurable students Learning Outcomes:

1. **Analyze** the performance of FET and MOSFET amplifiers
2. Analyze and design various applications of bipolar junction transistors such as oscillators and multivibrators
3. To define various regulator circuits
4. To describe working of SMPS

Title of the Course: Linear Integrated Circuits Course Code:UETC0402	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basic knowledge of Electronic Devices.

Course Description: Contents deal with the basic concepts of operational amplifier, linear & non-linear application of OP-AMP. It covers design and analysis of frequency selective and tuning circuits like oscillators, active filters, PLL and its use for communication and industrial applications. Along with switching applications like that of comparators, course content finds a due scope to learn IC based design of voltage regulators.

Course Objectives:

1. Explain the internal circuit of operational amplifier and its electrical parameters.
2. Indicate the importance of an Op-amp in building analog computations.
3. Explain the application of Op-amps in building signal conditioning circuits, filters, waveform generators etc.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Define Op-AMP parameters and characteristics.	I	Define
CO2	Select appropriate analog ICs by reviewing data sheets for industrial and domestic applications	I	Define
CO3	Analyze BJT Operational amplifier for DC and AC inputs.	II	Analyzing
CO4	Design of amplifiers, signal conditioners, filters, oscillators and wave shaping circuits using op-amp circuits.	VI	Design

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	1	1												
CO2	1			1								3		
CO3	1	2	1	1										3
CO4	1		3	1							1			3

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: ---Differential Amplifiers Differential Amplifier-Configuration, DC & AC Analysis of Dual Input Balanced Output Configuration. Comparative study of other configuration of Differential amplifiers, Constant Current Bias, Current Mirrors, DC coupling & Cascade differential stages, Level Translator & its need.(Numericals are expected).	**6 Hrs.**
Unit 2:---OP-AmpCharacteristics Block Diagram of Op-Amp, Ideal & Practical Op-amp specifications, Transfercharacteristics of Op-amp, Op-amp parameters & measurement: Input & outputoffsetvoltages,Input&outputoffsetcurrents,InputBiascurrent,slewrate,CMRR,PSRR,Thermaldrift.ComparativestudyofDataheets– (μA741,OP07,LM324,LM311,LM308,LM380,CA3140.)	**6 Hrs.**
Unit 3:--Negative Feedback In Op-Amps: Open Loop & closed Loop- Inverting, Non-Inverting and Differential (Using one op-amp). Analysis for Av, Ri, Ro, Bandwidth, and Total output offset voltage. AC & DC amplifiers – all configurations. (Numericals are expected). Open loop frequency Response, closed loop frequency response, circuit stability, slew rate.	**6 Hrs.**
Unit 4:---Op-amp Applications Summing amplifier (Inverting & Non-Inverting), Subtractor, Integrator, Differentiator, Instrumentation Amplifier (3 op-amps), Instrumentation amplifier using transducer bridge, I-V & V-I converter. (Numericals are expected). Comparators, Zero Crossing Detector, Window detector, Schmitt trigger, peak detector, log and antilog amplifier, precision rectifier, sample and hold circuit.	**8 Hrs.**
Unit 5:---Active Filters First & Second Order Butterworth Low Pass, High Pass, Band Pass, Band Reject, & All Pass Filters (Analysis & Numericals are Expected).	**4 Hrs.**
Unit 6:---Specialized IC Applications Sine wave generator- RC phase Shift, Wein Bridge, & Quadrature oscillator. Square wave (Astable Multivibrator), & Triangular Wave generator, V-F, F-V converter using Op-Amp. IC 555 (Timer): Block Diagram, Multivibrators and Applications. IC 566 VCO, PLL- Introduction, Block Diagram, Principles & description of individual blocks, IC 565 PLL & Applications. (Numericals are expected).	**6 Hrs.**

Textbooks:

1. Ramakant. A. Gayakwad, ‑Op-Amps & Linear Integrated Circuits‖, 3rdEdition, PHI.
2. 2 S.Salivahanan & Bhaaskaran, ‑Linear Integrated Circuits‖, 1st Edition, Tata McGraw Hill.
3. Sergio Franco, ‑Design with op-amp &Analog Integrated Circuits‖, 3rd Edition, Tata McGraw Hill

References:

1. NationalAnalog&InterfaceproductsDatabook—NationalSemiconductors
2. K.R.Botkar.‖IntegratedCircuits‖Khannapublications,10th Edition.
3. David. A.John &KenMartin, ‑AnalogIntegrated Circuit Design‖, Student Edition, Wiley.
4. Roy Choudhary & Shail. B. Jain, ‑LinearIntegrated Circuits‖, 2nd Edition,NewAge.

Unit wise Measurable Students Learning Outcomes:

1. Students should be able to have a firm grasp of basic principles of many operational amplifiers.
2. Student should beable to differentiate between different types of op-amps as well as able to choose proper op-amp as per application requirement.
3. Student should beable to analyze and design op-amp parameter compensating networks.
4. Student should be able to find out circuit stability from frequency response as well as frequency dependent parameters.
5. Students should be able to analyze and design different op-amp linear and nonlinear applications.
6. Student should be able to analysis of different types of Active filters, different types of monolithic ICs and its applications.

Title of the Course: Electromagnetic Engineering Course Code:UETC0403	L	T	P	Credit
	3	1	--	4

Course Pre-Requisite: Knowledge of Basic coordinate systems, vector algebra

Course Description: This course provides the foundations of electromagnetic theory, with applications in electrical and electronic engineering. Topics include: vector algebra, electrostatics, magneto statics, Faraday's law of electromagnetic induction, differential and integral forms of Maxwell's equations, boundary field conditions, electromagnetic waves, propagation of electromagnetic waves, transmission lines.

Course Objectives:

1. Students recall concepts from vector calculus, integral and differential equations in the analysis of electromagnetic problems
2. Students will able to define, identify, differentiate, illustrate and simulate electric and magnetic fields
3. Students recognize and analyze Maxwell'sequations
4. Students describe, recognize and manipulate plane electromagnetic waves in dielectric and conducting media
5. Students determine fundamental characteristics of simple transmission lines in the time domain and analyze it

Course Learning Outcomes:

1. The students will be able to design the transmissionline.
2. Studentswillbeabletounderstandthebasicconceptsofelectromagneticengineering
3. Able to analyze the parameters of plane waves and transmissionlines.

CO	Afterthecompletionofthecoursethestudent should be ableto	Bloom's Cognitive level	Descriptor
CO1	Relate vector calculus to static electric, magnetic fields in different Engineering situations.	II	Relate
CO2	Solve problems in vector calculus, electrostatic, magneto-static, plane waves and transmission lines	III	Solve
CO3	Analyze the Maxwell's equations in free space, time varying and static fields and apply them to diverse engineering problems.	IV	Analyze
CO4	Explain the phenomena of wave propagation in different media and Design transmission line by inputting different parameters	V	Explain

CO-PO Mapping:

CO-PO	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	1												
CO2	2	2		1										
CO3	1	2												
CO4	2	1	2		1							2	2	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE1and ISE2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE:Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with 60-70% Weightage for course content(normally last three modules) covered after MSE.

Course Contents:

Unit 1:--- Co-ordinate systems ReviewofvectorAnalysis, vectoralgebra,Pointandvectortransformation, del operator, Cartesian,Cylindricalandsphericalcoordinatesystems, Coulomb's law, electromagnetic spectrum. (Numerical expected)	05 **Hrs.**
Unit 2:--- Electrostatics Electric field intensity, field due to distributed charges, Electric Flux density, Gauss's law and its applications, divergence theorem, Electrostatic potential, potential gradient, electric dipole and moment, Electrostatic energy density, work done, Boundary conditions for electrostatic field. (Numerical expected)	08 **Hrs.**
Unit 3:--- Steady Magnetic Field Biot-Savart law, examples on magnetic Field Intensity due to infinite and finite line, Ampere's Circuital Law in integral and differential form, Magnetic flux density, Magnetic boundary conditions, Effect of dielectric medium, vector magnetic potential, Stoke's Theorem. (Numerical expected)	07 **Hrs.**
Unit 4:--- Maxwell's Equations Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, timevaryingfield&harmonicallyvaryingfields, Capacitance of simple configurations, Lorentz force,Comparisonof field & circuittheory.	04 **Hrs.**
Unit 5:--- Electromagnetic Waves Wavepropagationinfree space, dielectric&conductingmedia,Modificationinwaveequationsfor sinusoidal time variations, Characteristics of plane wave in a) pure dielectric media, b) Conductingmedia,Reflectionofelectromagneticwavefornormalincidence,Polarization, skin depth, Poynting theorem. (Numerical expected)	08 **Hrs.**
Unit 6:--- Transmission Lines Types of transmission lines, equivalent circuit, Transmission line equations, primary andsecondaryconstantsoftransmissionline,Transmissionlineparameters,terminated uniformtransmissionline,Short circuited and open circuited line, Phase velocity and group velocity, Reflectioncoefficient,VSWR, Smith chart.(Numerical expected)	08 **Hrs.**

Textbooks:

1. John D. Kraus, Electromagnetics, TataMcGraw-Hill publication.
2. S. C. Mahapatra and Sudipta Mahapatra, Principles of Electromagnetics, Tata McGraw-Hill, 2011.
3. Sadiku, Elements of Electromagnetics 4th edition,Oxford University Press.
4. RKShevgaonkar,Electromagnetic waves–Tatamc-GrawHill 1st Ed, 2005.
5. WHHaytandJABuck, ProblemsandSolutionsinElectromagneticsTatamc-GrawHill

References:

1] William Hayt,Buck,"Engineering Electromagnetics",McGraw Hill.
2] E.C.Jordan &K.Balman, ElectromagneticWavesandRadiatingSystems,2nd edition,PHI.
3] DavidK.Cheng,FieldandWaveElectromagnetics,PearsonEducation.
4] Kraus & Fleisch, ElectromagneticswithApplications,5thEdition,McGrawHillInternationalEdition

Unit wise Measurable students Learning Outcomes:

1. **Comprehend** the principles of electric and magnetic field.(L1,L2andL3)
2. **Apply** the fundamentals of electromagnetic to **analyze** the performance of transmission Lines and antennas. (L5 and L6)
3. **Compare and contrast** difference between static and time- varying electromagnetic fields. (L3)
4. **Design** the impedance matching network for maximum power transmission.(L4 and L5)
5. **Test, debug and evaluate** the performance of a typical transmission line in terms of VSWR, reflection coefficient using Smith Chart.(L5)
6. **Work in team** to prepare are port based on survey of effects of radiation (EMI) from cell phone, transmitters, antennas etc.

Title of the Course: Analog & Digital Communication Course Code: UETC0404	L	T	P	Credit
	4	-	-	4

Course Pre-Requisite: Electronic devices & circuits, signals & system.

Course Description: Course deals with understanding the principles of Analog and Digital Communication, study of different types of Noise in communication system .It describes the fundamentals of baseband transmission, modulation techniques.

Course Objectives:

1 . Describe & demonstrate different types of analog modulation and demodulation techniques.
2. Describe various types of Noise in communication systems.
3. Describe Conversion of analog to digital signals.
4. Describe the transmission and reception in digital communication system.
5. Evaluate performance of digital modulation methods.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Taxonomy	
		Level	Descriptor
CO1	Explain different analog modulation and Demodulation schemes.	II	Explain
CO2	Define different types of noise and their Classification.	I	Define
CO3	Illustrate the baseband transmission and reception.	II	Illustrate
CO4	Illustrate the Digital Modulation and demodulation techniques	II	Illustrate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1									2		1		
CO2	1	3	1	2						2		1	2	
CO3	1	3	1	2						2		1	2	
CO4		3	1	2						2		1	2	

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc. MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

Course Contents:

Unit:1. Amplitude Modulation and Demodulation: Introduction to Analog Communication System The Electromagnetic & Optical Spectrum and its usage; Radio spectrum and frequency allocation. Elements of communication systems, Need for modulation, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, phase representation of AM wave, AM modulating circuits: Low level AM modulation, medium power AM modulation, method Vestigial sideband(VSB). AM transmitters: Block of low level DSBFC, High level DSBFC, SSB suppression techniques. TRF and Super heterodyne receiver. Technical specification of AM broadcasting.	9Hrs.
Unit:2. Angle Modulation: Introduction to frequency and phase modulation. Mathematical representation of F.M. Frequency spectrum of F.M. wave. Generation of F.M. methods. Types of FM Receivers. Balanced Slope Detector, Ratio Detector, Foster-Seeley Discriminator, PLL Demodulator. Case study of AM/ FM relay station.	8Hrs
Unit:3. Noise: types and of Sources of Noise, Shot Noise, Resistor Noise, Calculation of Noise in Linear Systems, Noise Bandwidth, Noise Temperature, Noise in Two-Port Networks, Noise Figure, Measurement of Noise-Figure, Signal in Presence of Noise.	6Hrs
Unit:4. Digital transmission of analog signals: Introduction, Shannon's theorem of information, Sampling theorem, Study of Pulse Code Modulation- Uniform & Non uniform quantization, PAM, DPCM, Delta Modulation, ADM.	10Hrs
Unit:5. Baseband transmission & reception: Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband Pulse Shaping, M-ary Signaling, ISI, eye diagram, scrambler, Unscramble.	7Hrs
Unit:6. Baseband modulation techniques: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential Phase Shift Keying, QAM, Quadrature Phase Shift Keying (Encoder &Decoder).	8Hrs

Textbooks:

1) George Kennedy, "Electronic Communications", McGraw Hill.
2) Wayne Tomasi 'Electronics Communication System' -Fundamentals through Advanced. – 5th Edition-Pearson Education.
3) Analog and Digital communication – J S Chitode Technical Publications,2009

References:

1) B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2) Simon Haykin, "An introduction to analog & digital communications", john Wiley& Sons
3) R P Singh, S D Sapre 'Communication System-Analog & Digital' 2nd Edition –Tata Mc Graw Hill Publication.
4) Louis E. Frenzel, "Principles of Electronic Communication System",3rd Ed., TMH Publication.

Unit wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to

1) Describe & demonstrate different types of AM Transmitters and Receivers.

2) Describe & demonstrate different types of FM Transmitters and Receivers.

3) Discuss various types and calculations Noises in Communication System.

4) Identify different sections of Pulse Modulation techniques.

5) Describe & demonstrate different types of digital modulation and demodulation techniques.

6) Describe Digital transmission of analog signals.

7) Describe different baseband transmission & reception systems

Title of the Course:Data Structures Course Code:UETC0405	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basics of C and C++ programming language

Course Description: Explores array, stacks, queues, pointer, linked lists, graphs, trees and their algorithms including sorting, searching, iterating over data structures and recursion

Course Objectives:

1. To use & manipulate several core data structures: arrays, linked lists, stacks and queues.
2. To Understand design and implementation of basic data structures and algorithms.
3. To use various data structures effectively in different applications
4. To learn the theory of trees and graphs.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Explain the concepts of basic data structure operations	II	Explain
CO2	Apply the Algorithms to Add, delete, sort, and search for data structures like Array, linked list, Stack and Queue.	III	Apply
CO3	Evaluate the performance of algorithms for managing the data structure.	V	Evaluate
CO4	Illustrate the concept of trees, graphs and searching techniques.	II	Illustrate

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3	2		3	3							1	
CO2	2	3	2		3	3							1	
CO3	2	3	2	2	3	3							1	
CO4	2	3	2		3	3							1	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1:---Arrays & Pointers: Introduction to data structures (Linear and Non-Linear) Introduction of linear arrays: representation of linear array in memory, traversing linear arrays, inserting & deleting. Sorting: bubble sort & quick sort. Searching: linear search & binary search. Multidimensional arrays: matrices and sparse matrices. Pointers: pointer arrays.	**7 Hrs.**
Unit 2:-- - Stacks & Queues: Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists , Applications of stacks , stacks & recursion, Queue as an abstract data type representation, circular, double ended, priority queues	**6 Hrs.**
Unit 3:---Linked Lists: Introduction, linked lists & its representation in memory, traversing & searching in a linked list, Garbage collection, insertion & deletion of nodes in linked list, header linked list, two-way lists, circular linked list.	**6 Hrs.**
Unit 4:--- Trees: Binary Tree: Introduction, Basic terminology, representations through arrays & linked lists, traversal, reconstruction, applications & threaded binary trees. Advanced trees: AVL trees, operation. Multi-way trees: m-way search trees, B trees, operations. Heaps: construction, operation & application	**6 Hrs.**
Unit 5:---Graphs: Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, Shortest path Algorithm, linked representation of graphs, operations. Traversing, Posets, Topological sorting	**6 Hrs.**
Unit 6:--- Hashing Hashing, Hash functions, collision and chaining	**5 Hrs.**

Textbooks:

1. Seymour Lipschautz–'Data structures' - Shaum's outlines -Tata McGraw Hill
2. ISRD group –'Data structure using C '–- Tata McGraw Hill

References:

1. Langsam, Rubenstein, Tenenbaun–'Data structure using C & C++ ' - PHI
2. Mark Allen Weiss- 'Data structure & algorithm analysis in C'- 2nd edition –Pearson Education (LPE)
3. M.T. Goodrich, R. Tamassia, D. Mount- Data Structures & Algorithms in C++- Wiley Publication

4. A.N. Kathie-“ Introduction to Data structures in C"- Pearson Education (LPE)

Unit wise Measurable students Learning Outcomes:

7. Identify Linear and Non Linear data structures and analyze basic complexity issues of algorithms
8. Perform deferent operations on Linear data Structures.
9. Understand and perform operations on deferent types of link lists.
10. Use stack & queue in deferent applications.
11. Study different types of trees. 6. Perform deferent operations on graphs.

Title of the Course: Analog Circuits-II Lab	**L**	**T**	**P**	**Credit**
Course Code:UETC0406	**0**	**0**	**2**	**1**

Course Pre-Requisite: Analog Circuits - I

Course Description:
This course contains fundamentals of FET and MOSFET as amplifier. This course enables to students to analyze and design of basic application circuits such as oscillators, multivibrators, and voltage regulators by using discrete components like transistor and ICs.

Course Objectives:
1. To construct simple electronic circuits to accomplish specific function.
2. Testing of circuits developed in lab.
3. Evaluate performance of experiment studied.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive level	Descriptor
CO1	Analyze circuits (oscillators, multivibrators and regulators) to meet requirements.	IV	Analyze
CO2	Design circuits (oscillators, multivibrators and regulators) to meet requirements.	VI	Design
CO3	Build circuits (FET, MOSFET, oscillators, multivibrators and regulators) to meet requirements.	III	Build
CO4	Evaluate circuits (FET, MOSFET, oscillators, multivibrators and regulators) performance parameters.	V	Evaluate
CO5	Interpret results of experiment and compare with standard value.	V	Interpret

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3	2											1	
CO2		2	3	2									1	
CO3		2	3	2									1	
CO4		1			2								1	
CO5		2	1	1									1	

Assessments :
Teacher Assessment:
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1:--- **Aim and Objectives:** Calculation of performance parameters using characteristics	2**Hrs.**

of JFET. **Outcomes:** Student will be able to calculate **Theoretical Background:** Junction Field Effect Transistor **Experimentation:** Obtaining performance parameter using JFET characteristics. **Results and Discussions:** Comparison between Practical & Theatrical performance parameter. **Conclusion:**	
Experiment No. 2:--- **Aim and Objectives:** To study of single stage common source (CS) amplifier. **Outcomes:** The students will be able to design single stage common source (CS) amplifier. **Theoretical Background:** Theory and operation principle of single stage common source (CS) amplifier. **Experimentation:** Analysis, designing and implementation of single stage common source (CS) amplifier. **Results and Discussions:** Noted output voltage for different frequencies. **Conclusion:**	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:** To study of RC phase shift oscillator using FET/BJT **Outcomes:** The students will be able to design RC phase shift oscillator using BJT **Theoretical Background:** Theory and operation principle of RC phase shift oscillator using BJT **Experimentation:** Analysis, designing and implementation of RC phase shift oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:**	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:** To design of Colpitt‘s oscillator using FET/BJT **Outcomes:** The students will be able to design Colpitt‘s oscillator using BJT **Theoretical Background:** Theory and operation principle of Colpitt‘s oscillator using BJT **Experimentation:** Analysis, designing and implementation of Colpitt‘s oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:**	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives:** To design of Hartely oscillator using FET/BJT **Outcomes:** The students will be able to design Hartely oscillator using BJT **Theoretical Background:** Theory and operation principle of Hartely oscillator using BJT **Experimentation:** Analysis, designing and implementation of Hartely oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:**	2**Hrs.**
Experiment No. 6:--- **Aim and Objectives**: To design of Astable multivibrator **Outcomes:** The students will be able to design and evaluate Astable multivibrator **Theoretical Background:** Theory and operation principle of Astable multivibrator **Experimentation:** Analysis, designing and implementation of Astable multivibrator **Results and Discussions:** observed Waveforms **Conclusion:**	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives**: To design of Monostable multivibrator **Outcomes:** The students will be able to design and evaluate Monostable	2**Hrs.**

multivibrator **Theoretical Background:** Theory and operation principle of Monostable multivibrator **Experimentation:** Analysis, designing and implementation of Monostable multivibrator **Results and Discussions:** observed Waveforms **Conclusion:**	
Experiment No. 8:--- **Aim and Objectives**: To design of Bistable multivibrator **Outcomes:** The students will be able to design and evaluate Bistable multivibrator **Theoretical Background:** Theory and operation principle of Bistable multivibrator **Experimentation:** Analysis, designing and implementation of Bistable multivibrator **Results and Discussions:** observed Waveforms **Conclusion:**	2**Hrs.**
Experiment No.9 :--- **Aim and Objectives:** To study Zener shunt voltage regulator **Outcomes:** The students will be able to test Zener shunt voltage regulator **Theoretical Background:** Theory and operation principle of Zener shunt voltage regulator **Experimentation:** Analysis, designing and implementation of Zener shunt voltage regulator **Results and Discussions:** Observed Waveforms and noted analysis Parameters **Conclusion:**	2**Hrs.**
Experiment No. 10:--- **Aim and Objectives:** To study Emitter Follower Voltage Regulator **Outcomes:** The students will be able to test Emitter Follower Voltage Regulator **Theoretical Background:** Theory and operation principle Emitter Follower Voltage Regulator **Experimentation:** Analysis, designing and implementation of Emitter Follower Voltage Regulator **Results and Discussions:** Observed Waveforms and noted analysis Parameters **Conclusion:**	2**Hrs.**
Experiment No. 11:--- **Aim and Objectives:** To study Transistorised Series Voltage Regulator **Outcomes:** The students will be able to test Transistorised Series Voltage Regulator **Theoretical Background:** Theory and operation principle of Transistorised Series Voltage Regulator **Experimentation:** Analysis, designing and implementation of Transistorised Series Voltage Regulator **Results and Discussions:** Observed Waveforms and noted analysis Parameters **Conclusion:**	2**Hrs.**
Experiment No. 12:--- **Aim and Objectives:** Design of IC Voltage Regulator using LM317 or LM723 **Outcomes:** Student will be able to design Voltage Regulator using LM317 or LM723 **Theoretical Background:** Voltage Regulator using LM317 or LM723 **Experimentation:** Obtain line regulation and load regulation of IC voltage regulator **Results and Discussions:** Comparison between Practical and Theatrical analysis results **Conclusion:**	2**Hrs.**
Experiment No. 12:---	2**Hrs**

Aim and Objectives: To study of Step up and step down SMPS **Outcomes:** The students will be able to explain Step up and step down SMPS **Theoretical Background:** Theory and operation principle of Step up and step down SMPS **Experimentation:** Analysis of Step up and step down SMPS **Results and Discussions:** comparative understanding of Step up and step down SMPS **Conclusion:**	

Textbooks:

1. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj TMH Publication.
2. Electronic Devices and Circuits by Anil K. Maini, Varsha Agarwal- Wiley India.
3. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi, Pearson Publication.
4. Electronic Devices and Circuits by Allen Mottershead - PHI.

References:

1. Design of analog integrated circuits by BehzadRazavi, McGrawHill International edition
2. Schaum's Outlines, ― Electronic Devices and Circuits‖
3. Electronic Devices and Circuits by Mantri& Jain, Nikita Publication.
4. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication.
5. Electronic Devices and Circuits by J.B.Gupta, Katson Publication
6. Electronic Devices and Circuits by Millman, Halkias, TMH Publication.
7. National Semiconductor Data Manual.

Experiment wise Measurable students Learning Outcomes:

1. Understand theperformance of FET and MOSFET as amplifier.

2. Compare and contrast the oscillators, multivibrators circuits implemented using BJT.

3. **Analyze** the performance of regulators and SMPS.

Title of the Course: Linear Integrated Circuits Lab	**L**	**T**	**P**	**Credit**
Course Code:UETC0407	**-**	**-**	**2**	**1**

Course Pre-Requisite:
Basic Electronics circuits, Transistor as an Amplifier

Course Description:
The course aims to provide knowledge of operational amplifier, some special purpose ICs like IC 555 & IC565(PLL) and their applications.

Course Objectives:
This course aims to
1. Provide knowledge of op-amp & its electrical parameters
2. Provide knowledge of op-amp configurations & frequency response
3. Study linear and non linear applications of op-amp
4. Provide basic knowledge of special purpose ICs like IC555 and IC 565

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's level	Descriptor
CO1	Evaluate different parameters of op-amp viz input offset voltage, Slew rate, CMRR and analyze frequency response	V	Evaluate
CO2	Design linear and non-linear applications like rectifier, active filters, signal generators using op-amp.	VI	Design
CO3	Design the application of timer IC 555 for multivibrator	VI	Design
CO4	To test the simulation of Op-amp circuits.	VI	Test

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	1	1											1	
CO2	1	1	3									2	1	
CO3	1	1	3								2		1	
CO4	1	1			3								1	

Assessments :
Teacher Assessment:
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE-POE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1:--- **Aim and Objectives:** Study of datasheets of LM741, LF356, CA3140, OP177 **Outcomes:** Students will be able to define various electrical parameters of op-amp **Theoretical Background:** Definition of electrical parameters **Experimentation:** Study datasheets of various op-amp ICs to study their electrical parameters **Results and Discussions:** Comparison of electrical parameters of op-amp ICs **Conclusion:**	2 **Hrs.**
Experiment No. 2:--- **Aim and Objectives:** Measure op-amp parameters & compare with the standard specifications: (a) Measure input bias current, input offset current and input offset voltage. (b) Measure slew rate (LM/UA741C) (c) Measure CMRR (d) Compare the result with datasheet of corresponding Op Amp. **Outcomes:** Students will be able to evaluate various electrical parameters of op-amp **Theoretical Background:** Pin out of IC741 and Definition of electrical parameters **Experimentation:** Calculate various parameters of op-amp by following the design procedure **Results and Discussions:** Practical values of parameters **Conclusion:** op-amp parameters have been calculated and compared with their standard values. Calculated values are approximately same as that of the standard values	2 **Hrs.**
Experiment No. 3:--- **Aim and Objectives:** Design of inverting , non-inverting amplifier & plot their frequency response **Outcomes:** students will be able to understand the concept of inverting and non-inverting configuration of op-amp **Theoretical Background:** Inverting and non-inverting configuration of op-amp **Experimentation:** Apply DC and AC voltage to the Inverting and non-inverting configuration of op-amp. Measure the o/p voltage for i/p DC voltage. For AC voltage, increase the i/p frequency and note down the corresponding o/p voltage. **Results and Discussions:** Prepare a table of calculated and observed o/p voltage for DC i/p voltage. Plot the frequency response curve for AC i/p voltage. **Conclusion:** For inverting configuration of op-amp, i/p is inverted at the o/p and the amplitude of o/p is equal to the gain times the i/p. For non-inverting, there is no phase shift between i/p & o/p voltage.	2 **Hrs.**
Experiment No. 4:--- **Aim and Objectives:** Design of Summing, scaling, and averaging amplifier **Outcomes:** Students will be able design summing, scaling and averaging amplifier using op-amp **Theoretical Background:** Derivation for the o/p voltage for Summing, scaling, and averaging amplifier using inverting & non-inverting configuration	2 **Hrs.**

Experimentation: Design Summing, scaling, and averaging amplifier. Apply DC voltage to Summing, scaling, and averaging amplifier and measure the o/p voltage **Results and Discussions:** Measure o/p voltage and compare them with the theoretical values. **Conclusion:** Op-amp can be used as the summing, scaling and averaging amplifier. For summing amplifier, the o/p voltage is sum of the i/p voltages applied. In scaling amplifier, each i/p voltage is weighted by a different factor. In averaging amplifier, the o/p voltage is average of the i/p voltages applied	
Experiment No. 5:--- **Aim and Objectives:** Design, build and test precision half & full wave rectifier **Outcomes:** Students will be able to analyze o/p waveforms of precision HWR & FWR **Theoretical Background:** Operating principle of precision HWR & FWR **Experimentation: Construct circuits for** precision HWR & FWR. Apply AC signal of less than 0.7V to the i/p terminal of rectifier. Observe the o/p waveforms **Results and Discussions:** Observe the o/p waveforms and plot it on graph paper **Conclusion:** Precision rectifiers can rectify signals below 0.7V which is not possible with diode rectifier	2 **Hrs.**
Experiment No. 6:--- **Aim and Objectives:** Design, build and test Schmitt trigger **Outcomes:** Students will be able to explain operation of Schmitt trigger **Theoretical Background:** Operating principle of Schmitt trigger **Experimentation:** Design the Schmitt trigger for given specifications. Observe the i/p & o/p waveforms **Results and Discussions:** Determine upper & lower threshold voltage from observed waveforms and hysteresis loop. **Conclusion:** Schmitt trigger converts sinusoidal signal into square wave. Whenever i/p sinusoidal signal crosses upper & lower threshold voltage levels the o/p is switched from +Vsat to –Vsat & -Vsat to +Vsat respectively.	2 **Hrs.**
Experiment No. 7:- **Aim and Objectives:** Design of Butterworth High Pass and Low Pass filters **Outcomes:** Students will be able to explain operation of Butterworth High Pass and Low Pass filters **Theoretical Background:** Operating principle of filters **Experimentation:** Design filter for given cut-off frequency and gain. Apply AC signal to the i/p of filter. Increase the i/p frequency, observe the amplitude of o/p signal for corresponding i/p frequency. **Results and Discussions:** Plot the frequency response curve of Butterworth High Pass and Low Pass filters **Conclusion:** For LPF filter the remains constant till cut-off frequency. After reaching cut-off frequency, the gain reduces at the rate of -20dB/dec. Thus LPF allows signals below cut-off frequency while rejecting the signals above cut-off frequency. Similarly for HPF the gain increases at the rate of +20dB/dec till cut-off frequency. Thereafter the gain remains constant. Thus HPF rejects low frequencies and allows signals above cut-off frequency.	
Experiment No. 8:-	2 Hrs

Aim and Objectives: Design, build and test square & triangular wave generator **Outcomes:** Students will be able to design waveform generator **Theoretical Background:** Concept of oscillator **Experimentation:** Design square and triangular wave generator for given specification **Results and Discussions:** Observe the o/p waveforms. Note down frequency and amplitude of the o/p waveform **Conclusion:** Waveform generators are basically oscillators which generate square & triangular wave without applying any i/p signal	
Experiment No.9:- **Aim and Objectives:** Design of astable multivibrator using IC555 **Outcomes:** Students will be able to explain operation of astable multivibrator using IC555 **Theoretical Background:** Internal circuit of IC555 timer. Pin out of IC555**.** **Experimentation:** Design astable multivibrator using IC 555 timer to generate square wave of 50% duty cycle. **Results and Discussions:** Observe the o/p waveform. Calculate the duty cycle. **Conclusion:** IC 555 can be used to generate square wave of various duty cycle.	2 Hrs
Experiment No. 10:- **Aim and Objectives:** Design and simulate Wien bridge oscillator using Op-Amp **Outcomes:** Students will be able to design oscillator to generate sinusoidal signal **Theoretical Background:** Concept of oscillator **Experimentation:** Design and implement Wien bridge oscillator using Op-Amp To generate sinusoidal signal of given frequency. **Results and Discussions:** Observe the o/p. **Conclusion:** Op-amp can designed as an oscillator to generate sinusoidal signal of desired frequency.	2 Hrs
Textbooks: 1) Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition. 2) D.Roy Choudhary, Shail Jain, "Linear Integrated Circuits", New Age Int.	
References: 1) Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth edition,PE, 2006. (Ch-6) 2) David Bell, "Operational Amplifiers and Linear ICs",Third ed, Oxford University Press 3) B. Somanathan Nair, " Linear Integrated Circuits- Analysis, Design & Applications", Wiley India. 4) Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill., Third Edition	
Experiment wise Measurable students Learning Outcomes: 1) Students will be able to explain various electrical parameters of op-amp 2) Students will be able to calculate various electrical parameters of op-amp 3) Students will be able to design inverting and non-inverting amplifier using op-amp 4) Students will be able to design summing, scaling and averaging amplifier using op-amp 5) Students will be able to analyze o/p waveform of precision HWR & FWR	

6) Students will be able to analyze o/p waveform of Schmitt trigger
7) Students will be able to design butterworth LPF & HPF and analyze their operation from the frequency response
8) Students will be able to design square and triangular waveform generator.
9) Students will be able to design IC555 timer as astable multivibrator to generate square wave of various duty cycles
10) Students will be able to design wien bridge oscillator using op-amp to generate sinusoidal signal.

Title of the Course:Analog and Digital Communication Lab.	L	T	P	Credit
Course Code:UETC0408	-	-	2	1

Course Pre-Requisite: Electronic devices & circuits, signals & system.

Course Description: Course deals with different types of AM and FM transmitter and receivers with their working. Also course deals with digital modulation and demodulation types. Experiments are based on types of analog and digital modulation and demodulation techniques.

Course Objectives:

1. Describe & demonstrate different types of analog modulation and demodulation techniques.
2. Live Demonstration at AIR station of AM or FM transmission.
3. Describe & demonstrate different types of baseband transmission and modulation techniques.
4. Describe & demonstrate different types of digital modulation and demodulation techniques.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Cognitive level	Descriptor
CO1	Explain different Analog modulation and Demodulation schemes.	II	Explain
CO2	Illustrate the baseband transmission and Reception.	II	Illustrate
CO3	Illustrate different digital modulation and Demodulation schemes.	II	Illustrate

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	1									2		1		
CO2	1	3	1	2				1		2		1	2	
CO3	1	3	1	2				1		2		1	2	

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	25

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

ESE: Assessment is based on oral examination

Course Contents:	
Experiment No. 1: --- **Aim:** Experiment on practical implementation of Amplitude Modulation. **Objectives:** Demonstrate AM Modulation. **Outcomes**: Calculation of modulation index in different cases. **Theoretical Background:** Working of R.F. amplifiers, audio and power amplifier, balanced modulators. **Experimentation:** **Results and Discussions:** m = Em / Ec **Conclusion:** We observed that, ideal value of m=1.When m>1, we call it as over modulation. When m<1,we call it as undermodulation. InAM , amplitude of the carrier signal is changed according to instantaneous value of modulating signal.	2**Hrs.**
ExperimentNo.2: --- **Aim:** Experiment on practical implementation of calculation of modulation index by using a) AM signal and b) Trapezoidal Pattern **Objectives**: Demonstrate AM modulation and Demodulation using Trapezoidal pattern and AM spectrum. **Outcomes**: Calculation of modulation index using trapezoidal pattern and AM spectrum in different cases. Theoretical Background: Working of R.F. amplifiers, audio and power amplifier, balanced modulators. **Experimentation**: **Results and Discussions:** Using AM spectrum:m=(Vmax-Vmin)/(Vmax+Vmin)Using trapezoidal pattern: m = (A-B) / (A+B) **Conclusion**: We observed that, ideal value of m=1.When m>1, we call it as over modulation.When m<1,we call it as under modulation. In AM, amplitude of the carrier signal is changed according to instantaneous value of modulating signal.	2**Hrs.**
Experiment No. 3: --- **Aim:** Experiment on practical implementation of Amplitude Demodulation. **Objectives: Demonstrate** AM Demodulation. **Outcomes**: Study how to extract original signal using AM diode detector.Theoretical Background: Working of diode, rectifier, filter and balanced modulators. **Experimentation**: **Results and Discussions: To** see how original signal is extracted from modulated signal. **Conclusion**: We observed that, amplitude of original signal is changes in proportion to change in modulating signal.	2**Hrs.**
Experiment No. 4: --- **Aim:** Experiment on practical implementation of Frequency Modulation and also find the modulation index. **Objectives**: Demonstrate FM Modulation. **Outcomes**: Calculation of modulation index using Varactor diode. Theoretical Background: Working of amplifiers. Mixers,balanced	2**Hrs.**

modulators. Diode, rectifier, filter, working of varactor diode. **Experimentation**: **Results and Discussions:** Modulation index = (f2-f1) / fm **Conclusion**: In FM, frequency of the carrier signal is changed according to instantaneous value of modulating signal.	
Experiment No. 5: --- **Aim:** Experiment on practical implementation of Sampling and reconstruction and also observe aliasing effect by varying sampling frequency. **Objectives**: Demonstrate Sampling theorem. **Outcomes**: Observed aliasing effect and Nyquist criteria. Theoretical Background: Working of sample and hold circuit, filter. **Experimentation**: **Results and Discussions:** A Nyquist criterion is satisfied to avoid aliasing. Nyquist criteria is fs>2*fm. **Conclusion**: Sampling theorem states that, it is possible to convert continuous signal in to discrete signal and recovered back the original signal if the condition fs>2*fm is satisfied otherwise aliasing means merging one frequency into another is occurred.	2**Hrs.**
Experiment No. 6: --- **Aim:** Experiment on practical implementation of PAM system. **Objectives**: Demonstrate generation and detection of PAM. **Outcomes**: Observed ideal, natural and flat-top PAM. Theoretical Background: Working of sample and hold circuit, filter, sampling theorem. **Experimentation**: **Results and Discussions:** To produce ideal sampling, convolution between baseband signal and pulse signal is used. To produce natural sampling, BJT or FET as witch is used. To produce flat-top sampling, sample and hold (S/H) circuit is used. **Conclusion**: In this, by observing ideal, natural and flat-top sampling, we can write comparison between them.	2**Hrs.**
Experiment No.7: --- **Aim:** Experiment on practical implementation of PWM system. **Objectives**: Demonstrate generation and detection of PWM. **Outcomes**: Observed PWM using comparator. Theoretical Background: Working of sampling theorem, comparator. **Experimentation**: **Results and Discussions:** To produce PWM output, comparator is used. Saw tooth wave and pulse, both are applied to comparator circuit to produce PWM output. **Conclusion**: In PWM, width of the carrier signal is changed according to instantaneous value of modulating signal.	2**Hrs.**
Experiment No. 8: --- **Aim:** Experiment on practical implementation of Pre-emphasis and De-emphasis. **Objectives**: Demonstrate working of LPF and HPF in FM. **Outcomes**: Observed that to artificially boost high frequency component, we use HPF at FM transmitter side and getting back signal to original value, we use LPF at FM receiver side. Theoretical Background: Working of LPF, HPF and use of Semi Log graph paper. **Experimentation**:	2**Hrs.**

Results and Discussions: To artificially boost high frequency component, we use HPF at FM transmitter side and getting back signal to original value, we use LPF at FM receiver side. **Conclusion**: Pre-emphasis and De-emphasis are used to improve signal to noise ratio (SNR).	
Experiment No. 9: --- **Aim:** Visit to Music Studio/AIR/Doordarshan Kendra. **Objectives**: Demonstrate live working AM or FM system. **Outcomes**: To get live demonstration of working of all parts of AM or FM transmitter and recording studio. **Experimentation**: **Results and Discussions:** To get all the technical details like height of antenna, carrier and modulating signal frequency, power, and geographical coverage area. **Conclusion**: Students are getting live demo. To enhance the knowledge**.**	2**Hrs.**
Experiment No.10: --- **Aim:** Study of ASK, FSK&PSK transmitter and receiver. **Objectives**: Demonstrate ASK, FSK & PSK transmitter and receiver system. **Outcomes**: To demonstrate working of ASK, FSK & PSK transmitter and receiver **Experimentation**: **Results and Discussions:** Here it is possible to get all the details of how ASK signal is generated, transmitted and how it is effectively demodulated at receiver. **Conclusion**: ASK, FSK & PSK signal is generated, transmitted and how it is effectively demodulated at receiver.	2**Hrs.**
Experiment No. 11: --- **Aim:** Study of PCM transmitter and receiver. **Objectives**: Demonstrate PCM transmitter and receiver system. **Outcomes**: To demonstration of working of PCM transmitter and receiver. **Experimentation**: **Results and Discussions:** Here it is possible to get all the details of how FSK signal is generated, transmitted and how it is effectively demodulated at receiver. **Conclusion**: PCM signal is generated, transmitted and how it is effectively demodulated at receiver.	2 Hrs
Experiment No.12: --- **Aim:** Study of Delta modulation & Demodulation. **Objectives**: Demonstration of Delta modulation and demodulation system. **Outcomes**: To demonstration of working of Delta transmitter and receiver. **Experimentation**: **Results and Discussions:** Here it is possible to get all the details of how PSK signal is generated, transmitted and how it is effectively demodulated at receiver. **Conclusion**: Delta signal is generated, transmitted and how it is effectively demodulated at receiver.	2 Hrs
Experiment No.13: --- **Aim:** Study of QAM transmitter and receiver. **Objectives**: Demonstrate QAM transmitter and receiver system. **Outcomes**: To demonstration of working of QAM transmitter and receiver. **Experimentation**: **Results and Discussions:** Here it is possible to get all the details of how QAM signal is generated, transmitted and how it is effectively demodulated at receiver. **Conclusion**: QAM signal is generated, transmitted and how it is effectively demodulated at receiver.	2 Hrs

Experiment No.14: --- **Aim:** Study of different Data formats. **Objectives**: To study different Data formats. **Outcomes**: To demonstration different Data formats **Experimentation**: **Results and Discussions:** To get all the details of how different Data formats. **Conclusion**: Different Data formats are generated and study their results.	2 Hrs

Textbooks:

1) GeorgeKennedy,"ElectronicCommunications",McGrawHillKennedy.

2) WayneTomasi'ElectronicsCommunicationSystem'-FundamentalsthroughAdvanced. -5th Edition-PearsonEducation.

3) AnalogandDigitalcommunication–JSChitodeTechnicalPublications, 2009

References:

1) B.P.Lathi,"AnalogandDigitalCommunication",OXFORDUniversitypress.

2) Simon Haykin,"An introduction to analog & digital communications", John Wiley& Sons

3) R P Singh, S D Sapre 'Communication System-Analog & Digital' 2nd Edition –Tata McGraw Hill Publication.

4) LouisE. Frenzel,"Principlesofelectroniccommunicationsystem",3rd Ed.,TMHPub.

Experiment wise Measurable Students Learning Outcomes:

1. Calculation of modulation index in different cases.
2. Calculation of modulation index using trapezoidal pattern and AM spectrum in different cases.
3. Study how to extract original signal using AM detector.
4. Calculation of modulation index using varactor diode.
5. Observed aliasing effect and Nyquist criteria.
6. Observed ideal, natural and flat-top PAM.
7. Observed PWM using comparator.
8. Observed that to artificially boost high frequency component, we use HPF at FM Transmitter side and getting back signal to original value, we use LPF at FM receiver side.
9. To get live demonstration of working of all parts of AM or FM transmitter, recording studio.
10. Observed ASK output.
11. Observed FSK output.
12. Observed PSK output.
13. Observed QAM output.
14. Observed different data formats.

Title of the Course: Data Structures Lab	L	T	P	Credit
Course Code:UETC0409	-	-	2	1

Course Pre-Requisite: Basics of C and C++ programming language

Course Description:
Explores linear & nonlinear data structures and algorithms including sorting, searching, iterating over data structures and recursion

Course Objectives:
1. Develop programming skills to design simple linear and non linear data structures.
2. Strengthen the ability to identify and apply the suitable algorithm for the real world problem
3. Gain knowledge in practical applications of data structures.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Taxonomy	
		level	Descriptor
CO1	Develop linear &non linear data structures	VI	Develop
CO2	Apply various searching and sorting algorithms on linear array.	III	Apply
CO3	Demonstrate the various operations on stack and queue.	II	Demonstrate
CO4	Develop Tree & Graph traversing algorithms	VI	Develop

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3	2		3	3							1	
CO2	2	3	2		3	3							1	
CO3	2	3	2		3	3							1	
CO4	2	3	2		3	3							1	

Assessments:

Teacher Assessment:
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
ESE: Assessment is based on oral examination

Course Contents:

Program No. 1: - Program to Insert & Delete the Number in a 1D Array Aim and Objectives: To Insert & Delete the Number in a 1D Array. Outcomes: Implement insertion & deletion algorithm for 1D array. Theoretical Background: Study of linear array. Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 2:- Program to implement different Sorting algorithm Aim and Objectives: To implement program on bubble and quick sort. Outcomes: Implement bubble sort algorithm for 1D array. Theoretical Background: Study of linear array. Experimentation: Results and Discussions:	02 Hrs.

Conclusion:	
Program No. 3:- Program to implement different searching algorithm Aim and Objectives: To implement program for Linear and Binary Search. Outcomes: Implement linear search algorithm for 1D array. Theoretical Background: Study of linear array. Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 4:- Program to Insert and Delete a Node in single Link List. Aim and Objectives: To implement program for Insertion of Node in Link List Outcomes: Implement algorithm for Insert and delete a Node in single Link List Theoretical Background: Study of link list. Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 5:- Program to implement push and pop operation on stack. Aim and Objectives: To implement program for Deletion of Node from Link List Outcomes: Implement algorithm for Deletion of Node from Link List Theoretical Background: Study of link list Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 6:-Program to implement Operation on Queue (insert and delete operation) Aim and Objectives: To implement program for insertion & deletion in queue. Outcomes: Implement algorithm for Insertion & Deletion in queue. Theoretical Background: Study of queue. Experimentation: Results and Discussions:	02 Hrs.
Program No. 7:-Program to implement Traversing operation of Tree. Aim & Objectives: Implement algorithm for differentTraversing operations of Tree Outcomes: Understand differentTraversing operations of Tree Theoretical Background: Trees Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 8:- Program to implement Traversing operation of Graph. Aim & Objectives: Implement algorithm for differentTraversing operations of Graph Outcomes: Understand different Traversing operations of Graph Theoretical Background: Graphs Experimentation: Results and Discussions: Conclusion:	02 Hrs.
Program No. 9: - Program to implement Warshall's Algorithm Aim & Objectives: Implement Warshall's Algorithm Outcomes: Understand Warshall's algorithm to find out shortest distance Theoretical Background: Graphs Experimentation: Results and Discussions: Conclusion:	02 Hrs.**.**
Program No. 10: - Program to implement Hashing operation. Aim & Objectives: Implement algorithm for differentoperations of Hashing	02 Hrs.**.**

Outcomes: Understand differentTraversing operations of Hashing Theoretical Background: Hashing Experimentation: Results and Discussions: Conclusion:	

Textbooks:

1. Seymour Lipschautz, " Data Structures", Tata McGraw Hill, 2002
2. ISRD group, Data structures using C, Tata McGraw Hill, 2006

References:

1] Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", Pearson Education Asia, 2nd Edition, 2002, ISBN-81-7808-729-4.

2] Ellis Horowitz, S. Sahni, D. Mehta "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi 1995 ISBN 16782928

Experiment wise Measurable Students Learning Outcomes:

1. Manipulate 1D array.
2. Apply bubble and quick sorting algo on 1D array
3. Perform Linear and Binary search algo on 1D array
4. Insert and Delete the Node in Link List
5. Implement stack using linear array
6. Implement queue using linear array
7. Using different traversing algo Travers Tree.
8. Using different traversing algo Travers Graph.
9. Implement Warshall's Algorithm
10. Implement hashing operations

Title of the Course: Mini Project -I	**L**	**T**	**P**	**Credit**
Course Code: UETC0410	**-**	**-**	**2**	**1**

Course Pre-Requisite: Analog Circuits, Digital Design, Linear integrated circuits, Network Analysis.

Course Description: Course will cover all the implementation of theoretical design, simulation and practical implementation.
This LAB will help to develop sensitivity of students towards social problem, think critically to findinnovativesolutionsto industrial / engineering problem/ simplifyhuman life.

Course Objectives:
1. Evaluatesocialneeds.
2. Identifysuitableproblemthatcanbesolvedusingfirst yearengineeringknowledgeandbasic knowledgeof electronics engineeringand programming.
3. Designandimplement the solutionusinghardware/softwareorboth
4. Testingoftheimplementation
5. Writeprojectreportasper standardformat

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Taxonomy level	Bloom's Taxonomy Descriptor
CO1	Identify social problem that can be implantable using first principles of science, engineering and skills like CAD Tools, Programming, basics of electronics.	III	Identify
CO2	Analyze and Design/ simulate the model of project work	VI	Analyze
CO3	Select appropriate components and devices by interpreting datasheets.	V	Select
CO4	Test the developed electronics system and Write comprehensive report on project work	III	Test

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO1	PSO2
CO1	1												2	1
CO2		1	3										2	1
CO3	1													1
CO4					2				3	3				1

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25

ISE is based on practical performed Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Guidelines:

- This lab prepares students to develop thinking process to solve social/engineering problems by applicationof scienceand engineering in innovative manner.
- The groupof should identify social/ Engineeringproblems,performrequirementanalysis.
- Afterinteractionswithcoursecoordinatorandbasedoncomprehensive literature survey/need analysis, the student shall identify the title and define the aim andobjectives of project.
- As per requirements the group should develop specifications of final outcome ofthe project.
- The students should think critically and undertake designof the project with skills availablewith them to meet the requirements and specifications.
- The group is expected to detail out specifications,methodology, resources required, critical issues involved in design, simulation and implementation and submit theproposal within first week of the semester.
- The student is expected to exert on design, development andtesting of the proposed work as per the schedule.
- The working model of the project should be demonstratedforinternalsubmission.
- Completed project and documentation in the formofproject report is to be submitted at theendofsemester.Theproject shouldcompletein 12weeks includingfield trailsifany.
- Attheendof project,theguideshouldadvisestudentstoprotectIPeitherintheformofPatentorregistrationof design or publishpaperonworkcompleted orparticipatein projectcompetition

The probable areas of the project work (but not only restricted to): Environment protection, globalwarming, safe drinking water, waste management, renewable energy utilities, biomedical engineering,accidentprevention,enablingweakersectionofsociety,efficiency/cost/timeimprovements,humanhardshipreduction,prosthesis,smartcity, smarttransportation, Pandemic prevention equipments.
Evaluations of reference designs published by various IC manufactures.

Schedule for project work:

a) Students are expected to Design and simulate all assignments during the semester in a group. Group shall consist of **maximum of three** students.
b) students should finalize the project group in 1st week
c) Presentation of synopsis and PERT-CPM chart. Group will submit the synopsis of the project during second/ third week after the approval of teacher. (Problem statement may be different for eachgroup), Block diagram and Specifications for system
d) steps for implementation of the system: (3rd week till end of semester)
   1. Block diagram and development of Specifications for system and specifications of each block. Based on the availability of components and cost.
   2. DesignCalculations
   3. Simulationusing appropriate EDA tool (NI Multisim/Orcad/Pspice / Altium Designer suite etc.)
   4. ComponentSelection
   5. Hardware implementation: PCB design / Assembling/ Testing/Calibration
   6. Conclusion.
   7. Report preparation
   8. Final Presentation and demonstration

Textbooks:

1. Measurement,Instrumentation,andSensorsHandbook‖,JohnG.Webster,CRC Press,1999.
2. PrintedCircuitBoards:Design,Fabrication,andAssembly‖,R.Khandpur,McGraw-Hill ,05
1. SPICE for Circuits and Electronics Using PSPICE Paperback –August 1994 by M.H. Rashid

References:

1. Practicaldesignofpowersupplies|,RonLenk,JohnWiley&Sons,2005
2. The Circuit Designer‘s Companion‖, Peter Wilson, Elsevier Ltd,2012
3. Printed Circuits Handbook, 7th Edition, Clyde Coombs, Happy Holden,McGraw-Hill ,2016

Websites:

1. https://www.element14.in/
2. https://www.mouser.in/
3. https://www.digikey.in/
4. https://www.electronicscomp.com/
5. https://www.microchip.com/
6. https://www.ti.com/
7. https://www.st.com/
8. https://www.maximintegrated.com/
9. https://www.semiconductor-technology.com/
10. https://www.globalspec.com/
11. https://www.onsemi.com/
12. https://www.nxp.com/

Title of the Course: Constitution of India	L	T	P	Credit
Course Code:UETA0401	2	-	-	3

Course Pre-Requisite: Basics of Indian History, Independence Movement, Fundamentals of Civics.

Course Description: This Course is an introduction of Indian Constitution and basic concepts highlighted in this course for understanding the Constitution of India. This course is structured to give a deeper insight for making the nexus between the other law subjects.

Course Objectives

At the end of the course the student is expected to have acquired:

1. A basic understanding of Constitution of India.
2. Builds the ability to apply the knowledge gained from the course to current social legal issues.
3. Ability to understand and solve the contemporary challenges.
4. Understanding constitutional remedies.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	**Explain** the significance of Indian Constitution as the fundamental law of the land	II	Cognitive (Understand)
CO2	Exercise his fundamental rights in proper sense at the same time **Identifies** his responsibilities in national building.	II	Cognitive (Applying)
CO3	**Analyze** the Indian political system, the powers and functions of the Union, State and Local Governments in detail	II	Cognitive (Understand)
CO4	**Understand** Electoral Process, Emergency provisions and Amendment procedure.	II	Cognitive (Understand)

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1						3		3				3			
CO2						3		3	3	3		3			
CO3						3			3			3			
CO4						3			3			3			

Assessments:

Teacher Assessment:

One End Semester Examination (ESE) having 100% weights respectively.

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1:- Constitution – Structure and Principles	(03) Hrs.
1.1: Meaning and importance of Constitution	

1.2: Making of Indian Constitution – Sources 1.3: Salient features of Indian Constitution	
Unit 2:- Fundamental Rights and Directive Principles 2.1: Fundamental Rights & Fundamental Duties 2.2: Directive Principles of State Policy	**(10) Hrs.**
Unit 3:- Union Government & Executive 3.1: President of India – Qualification, Powers and Impeachment 3.2: Lok Sabha & Rajya Sabha Sabha- Composition, Powers & Functions, Scope to amendment in Constitution	**(04) Hrs.**
Unit 4:- State Government & Executive 4.1: Governor – Qualification, Appointment, Powers & Functions 4.2: Legislative Assembly & Legislative Council – Composition, Powers & Functions	**(03) Hrs.**
Unit 5:- The Judiciary 5.1: Features of Judicial System in India 5.2: Hierarchy of Courts, Composition and Jurisdiction	**(03) Hrs.**
Unit 6:- Local Self Government and other constitutional Organizations 6.1: 73rd and 74th Constitutional Amendments 6.2: Public Service Commission, Election Commission, CAG, National Commissions for SC, ST etc.	**(03) Hrs.**

Textbooks:

1. M.P. Jain, Indian Constitutional Law
2. M.P. Singh (ed.),V.N. Shukla, Constitutional Law of India
3. D.D. Basu, Commentary on the Constitution of India
4. S.S. Desai, Constitutional Law--I & II

References:

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, 2018 (23rd edn.)
2. J.N. Pandey, The Constitutional Law of India, Allahabad; Central Law Agency, 2018 (55th edn.)
3. Shripad Shridhar Desai, Constitutional Law--I, S.S. Law Publication, 2021
4. Shripad Shridhar Desai, Constitutional Law --II, S.S. Law Publication, 2021
5. Constitution of India (Full Text), India.gov.in., National Portal of India, https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf
6. Durga Das Basu, Bharatada Samvidhana Parichaya, Gurgaon; LexisNexis Butterworths Wadhwa, 2015