

**Kolhapur Institute of Technology's
COLLEGE OF ENGINEERING (AUTONOMOUS)
Gokul Shirgaon, Kolhapur**



KOLHAPUR INSTITUTE
OF TECHNOLOGY'S
**COLLEGE OF
ENGINEERING**
(AUTONOMOUS),
KOLHAPUR

Curriculum Structure

(As Per NEP guidelines)

For

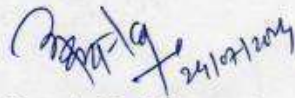
B. Tech E&TC Engineering

Academic Year 2024-2025

Under Graduate Programme




Dr. Y. M. Patil
Head of Department


Dr. A. R. Thorvat
Dean Academics

B. Tech. in Electronics & Telecommunication Engg.**w.e.f. A.Y: 2024-25 (S.Y.B. Tech)****SEMESTER-III**

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs./ Week	Credits	Evaluation Scheme			
									Component	Marks		
										Max	Min. for passing	
1	PC	UETPC0301	Analog Circuits	3	1	-	4	4	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
2	PC	UETPC0302	Differential Equations and Integral Transforms	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
3	PC	UETPC0303	Digital System Design	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
4	PC	UETPC0304	Electronics Instrumentation & Measurement	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
5	VE	UETVE0305	Environmental Studies	2	-	-	2	2	ISE	50	20	20
6	HSSM	UETEM0306	Engineering Management	2	-	-	2	2	ESE	50	20	20
7	PC	UETPC0331	Analog Circuits Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(POE)	50	20	
8	PC	UETPC0332	Digital System Design Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(POE)	25	10	
9	PC	UETPC0333	Electronics Instrumentation & Measurement- Laboratory	-	-	2	2	1	ISE	25	10	
10	OJT	UETIL0371	Mini Project-I	-	-	2	2	1	ISE	50	20	
11	MM	UETMM03**	Multidisciplinary Minor-I	2	-	-	2	2	ESE	100	40	
			Total:				27	23	Total Marks: 800 Total Credit: 23			

SEMESTER-IV

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs./ Week	Credits	Evaluation Scheme			
									Component	Marks		
										Max	Min for Passing	
1	PC	UETPC0401	Network Analysis	2	-	-	2	2	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
2	PC	UETPC0402	Signals and Systems	2	-	-	2	2	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
3	PC	UETPC0403	Analog & Digital Communication	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
4	PC	UETPC0404	Linear Integrated Circuits	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
5	PC	UETPC0405	Electromagnetic Engineering	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
6	VE	UETVE0406	Constitution of India	2	-	-	2	2	ISE	50	20	
7	PC	UETPC0431	Analog & Digital Communication Laboratory	-	-	-	2	1	ISE	25	10	
									ESE(POE)	25	10	
8	PC	UETPC0432	Linear Integrated Circuits Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(POE)	25	10	
9	OJT	UETIL0471	Mini Project-II	-	-	2	2	1	ISE	25	10	
10	VS	UETVS0433	Electronics Computer Aided Design (E-CAD)	-	-	2	2	1	ISE	25	10	
11	CC	UETCC0434	Co-Curricular Activities-II	-	-	2	2	1	ISE	50	20	
12	MM	UETMM04**	Multidisciplinary Minor-II			-	3	3	ESE	100	40	
				Total:			28	23	Total Marks: 850 Total Credit: 23			

*: Program Elective, ~: Open Elective

B. Tech. Electronics & Telecommunication Engg.

AY: 2025-26 (TY B. Tech)

SEMESTER-V

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component	Marks		
										Max	Min for passing	
1	PC	UETPC0501	Microcontrollers	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
2	PC	UETPC0502	Control Systems	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
3	PC	UETPC0503	Digital Signal Processing	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
4	PEC	UETPE05*	Program Elective-I	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
5	OE	UETOE05~	Open Elective-I	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
6	AE	UETAE0531	Business Communication and Value Science	-	-	2	2	1	ISE	50	20	
7	PC	UETPC0532	Microcontrollers Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(POE)	25	10	
8	PC	UETPC0533	Digital Signal Processing Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(OE)	25	10	
9	VS	UETVS0534	Model Based Design Laboratory	-	-	2	2	1	ISE	25	10	
10	CEP	UETIL0571	Object Oriented Programming	-	-	2	2	1	ISE	25	10	
11	MM	UETMM05**	Multidisciplinary Minor-III	3	-	-	3	3	ESE	100	40	
Total:							28	23	Total Marks: 800 Total Credit: 23			

*: Program Elective, ~: Open Elective

SEMESTER-VI

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component	Marks		
										Max	Min for Passing	
1	PC	UETPC0601	Embedded System	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
2	PC	UETPC0602	VLSI Design	2	-	-	2	2	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
3	PC	UETPC0603	Computer Networks	2	-	-	2	2	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
4	PEC	UETPE06*	Program Elective-II	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
5	OE	UETOE06~	Open Elective-II	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
6	HSSM	UETEM0604	Advanced Data Structure	2	-	-	2	2	ESE	50	20	
7	PC	UETPC0631	Embedded System Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(POE)	25	10	
8	PC	UETPC0632	VLSI Design Laboratory	-	-	2	2	1	ISE	25	10	
									ESE(OE)	25	10	
9	PC	UETPC0633	Computer Networks Laboratory	-	-	2	2	1	ISE	25	10	
10	FP	UETIL0671	Industrial Automation	-	-	2	2	1	ISE	25	10	
11	CC	UETCC0634	Co-Curricular Activities-III	-	-	2	2	1	ISE	50	20	
12	MM	UETMM06**	Multidisciplinary Minor-IV	3	-	-	3	3	ESE	100	40	
Total:							28	23	Total Marks: 850		Total Credit: 23	

*: Program Elective, ~: Open Elective

B. Tech. Electronics & Telecommunication Engg.

AY: 2026-27 (Final Year B. Tech)

SEMESTER-VII

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme		
									Component	Marks	
										Max	Min for Passing
1	PC	UETPC0701	Mobile Communication Network	3	-	-	3	3	ISE1	10	40
									MSE	30	
									ISE2	10	
									ESE	50	
2	PC	UETPC0702	Power Electronics	3	-	-	3	3	ISE1	10	40
									MSE	30	
									ISE2	10	
									ESE	50	
3	PC	UETPC0703	RF & Microwave Engineering	3	-	-	3	3	ISE1	10	40
									MSE	30	
									ISE2	10	
									ESE	50	
4	PEC	UETPE07*	Program Elective-III	3	-	-	3	3	ISE1	10	40
									MSE	30	
									ISE2	10	
									ESE	50	
5	OE	UETOE07~	Open Elective-III	2	-	-	2	2	ISE1	10	40
									MSE	30	
									ISE2	10	
									ESE	50	
6	PC	UETPC0731	RF & Microwave Engineering Laboratory	-	-	2	2	1	ISE	25	10
									ESE(OE)	25	10
7	PC	UETPC0732	Power Electronics Laboratory	-	-	2	2	1	ISE	25	10
									ESE(POE)	25	10
8	RM	UETIL0771	Project-I	-	-	8	8	4	ISE	50	20
									ESE(OE)	50	20
9	MM	UETMM07**	Multidisciplinary Minor-V	3	-	-	3	3	ESE	100	40
Total:							29	23	Total Marks: 800 Total Credit: 23		

*: Program Elective, ~: Open Elective

SEMESTER-VIII

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component	Marks		
										Max	Min for Passing	
1	PEC	UETPE08*	Program Elective-IV	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
2	PEC	UETPE08*	Program Elective-V	3	-	-	3	3	ISE1	10	20	40
									MSE	30		
									ISE2	10		
									ESE	50		
3	OJT	UETIL0871	Internship	-	-	12	12	6	ISE-I	75	30	
									ISE-II	75	30	
4	RM	UETIL0872	Project -II	-	-	8	8	4	ISE	50	20	
									ESE(OE)	50	20	
5	CC	UETCC0831	Co-Curricular Activities-IV	-	-	2	2	1	ISE	50	20	
Total:							28	17	Total Marks: 500 Total Credit: 17			

*: Program Elective, ~: Open Elective

Program Electives:*PROGRAM ELECTIVE-I**

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETPE0511	Antenna and Wave Propagation	3	0	0	3	3
2	UETPE0512	Probability Theory and Stochastic Processes	3	0	0	3	3
3	UETPE0513	Electronic System Design	3	0	0	3	3
4	UETPE0514	Computer Architecture & Organization	3	0	0	3	3

PROGRAM ELECTIVE -II

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETPE0611	Operating System	3	0	0	3	3
2	UETPE0612	Automotive Electronics	3	0	0	3	3
3	UETPE0613	Biomedical Instrumentation	3	0	0	3	3
4	UETPE0614	Embedded Linux	3	0	0	3	3

PROGRAM ELECTIVE -III

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETPE0711	Information Theory & coding	3	0	0	3	3
2	UETPE0712	Mechatronics	3	0	0	3	3
3	UETPE0713	Multimedia Engineering	3	0	0	3	3
4	UETPE0714	Optical Fiber communication	3	0	0	3	3
5	UETPE0715	Digital TV and Multimedia	3	0	0	3	3

PROGRAM ELECTIVE-IV

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETPE0811	Digital Image Processing	3	0	0	3	3
2	UETPE0812	Cyber security	3	0	0	3	3
3	UETPE0813	CMOS VLSI	3	0	0	3	3
4	UETPE0814	Real Time Systems	3	0	0	3	3

PROGRAM ELECTIVE- V

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETPE0815	System on Chip	3	0	0	3	3
2	UETPE0817	Cryptography & Network Security	3	0	0	3	3
3	UETPE0818	Machine Learning	3	0	0	3	3

~ Open Elective Courses

OPEN ELECTIVE -I

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UILOE0522	Global Marketing Management	3	-	-	3	3
2	UILOE0531	Ethics in Engg practices	3	-	-	3	3
Total:						6	6

OPEN ELECTIVE-II

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UILOE0622	Engineering Econometrics	3	-	-	3	3
Total:						3	3

OPEN ELECTIVE-III

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UILOE0724	Industrial Instrumentation	2	-	-	2	2
Total:						2	2

A. Bucket-I: Multidisciplinary Minor in Cyber Security

****Multi disc. minor**

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETMM0341	Information Theory for Cyber Security	2	-	-	2	2
2	UETMM0441	Data Encryption	3	-	-	3	3
3	UETMM0541	Steganography & Digital Watermarking	3	-	-	3	3
4	UETMM0641	Security Assessment & Risk Analysis	3	-	-	3	3
5	UETMM0741	Database security & Access Control	3	-	-	3	3
Total:						14	14

B. Bucket-II: Multidisciplinary Minor in Computer Vision

****Multi disc. minor**

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETMM0342	Computer Graphics	2	-	-	2	2
2	UETMM0442	Machine Learning	3	-	-	3	3
3	UETMM0542	Deep Learning	3	-	-	3	3
4	UETMM0642	Image Processing	3	-	-	3	3
5	UETMM0742	Pattern Recognition & Computer Vision	3	-	-	3	3
Total:						14	14

C. Bucket-III: Multidisciplinary Minor in Robotics & Automation

****Multi disc. minor**

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UELMM0341	Introduction to Robotics & Automation	2	-	-	2	2
2	UELMM0441	Sensors in Automation	3	-	-	3	3
3	UELMM0541	Microprocessor & Real Time Embedded Systems	3	-	-	3	3
4	UELMM0641	Artificial Intelligence in Robotics	3	-	-	3	3
5	UELMM0741	Applications of Robotics & Automation	3	-	-	3	3
Total:						14	14

D. Emerging Minor in Sensor Technology

Emerging area minor							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETMN0361	Sensor Technology : Physics, Fabrication and Circuits	3	1	-	4	4
2	UETMN0461	Micro-sensor circuits	3	1	-	4	4
3	UETMN0561	Sensors & Sensor Circuits	3	1	-	4	4
4	UETMN0661	Electric Vehicle Sensors	3	1	-	4	4
5	UETMN0761	Industrial Sensors	2	-	-	2	2
Total:						18	18

E. B.Tech. (Hons) in IOT.

Emerging specialization minor							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETHN0351	DBMS in Cloud	3	1	-	4	04
2	UETHN0451	Python for Cloud Computing	3	1	-	4	04
3	UETHN0551	IOT Architecture and Protocols	3	-	-	3	03
4	UETHN0651	Design of IOT Devices	3	1	-	4	04
5	UETHN0751	Data Analytics and Security of IOT	3	-	-	3	03
Total:						18	18

Exit Courses

A. After First Year:

The candidate should pass any two suitable skill based courses to qualify for Certification.

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETEX0291	Consumer Electronics	4	-	-	4	4
	UETEX0292	Radio Engineering	4	-	-	4	4
2	UETEX0293	Electronics Servicing and Maintenance of photo copy machine	4	-	-	4	4
3	UETEX0294	Electronic Materials & Components	4	-	-	4	4
Total:							12

B. After Second Year:

The candidate should pass following skill based courses to qualify for Diploma.

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETEX0491	Data Communication and Networking	3	-	-	3	3
2	UETEX0492	Electronics Servicing and Maintenance	3	-	-	3	3
3	UETEX0493	Industrial Training	2	-	-	2	2
Total:							8

C. After Third Year:

The candidate should pass following skill based courses to qualify for B. Voc

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UETEX0691	Advanced Mobile Communication	3	-	-	3	3
2	UETEX0692	Cyber Security	3	-	-	3	3
3	UETEX0693	Internship	2	-	-	2	2
Total:							8

S Y Content wise Syllabus

SEM-I

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-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.	08 Hrs.
Unit2:- FET(Field Effect Transistor): JFET: Types, Construction, operation, V-I characteristics, Parameters 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.
Unit3:-Bipolar Junction Transistor Analysis Biasing- DC load line and bias point, fixed bias, collector to base bias & voltage divider bias and stability factor for all biasing circuits. AC Analysis: Coupling and bypass capacitors, AC load line, transistor model and parameters, common emitter circuit analysis, common collector circuit analysis.	07 Hrs.
Unit 4:-Field Effect Transistor Analysis Biasing- DC load line and bias point, Fixed-Bias, Self-Bias, Voltage-Divider. AC Analysis: Coupling and bypass capacitors, AC load line, FET model and Parameters, common source circuit analysis, common drain circuit analysis.	07 Hrs.
Unit 5:-Small Signal Amplifier: Single stage common emitter amplifier, Single stage common source amplifier, capacitor coupled two stage CE amplifier, direct coupled two stage circuits, two stage circuit with emitter follower output, small signal high frequency amplifier,	07 Hrs.
Unit6:-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 Crossover distortion, Complimentary symmetry amplifiers.	08 Hrs.
Textbooks: 1. Electronic Devices and circuits by S.Salivahanan, NSureshKumar, AVallavaraj TMH Publication 2. A.S.Sedra and K.C.Smith, Microelectronic Circuits Saunders College Publishing, 1991. 3. David A. Bell, —Electronic Devices and Circuits, 5ed, Oxford University Press, 2008. 4. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication.	
References: 1. Electronic Devices and Circuits by A.P. Godse and U.A. Bakshi scitech Publication. 2. Electronic Devices and Circuits by Allen Mottershead-PHI 3. Electronic Devices and Circuits by J.B.Gupta, Katson Publication 4. Electronic Devices and Circuits by Millman, Halkias, TMH Publication. 5. Electronic Devices and Circuits by Mantri & Jain, Nikita Publication.	
Unit wise Measurable students Learning Outcomes: 1. Analyze the performance of various regulators. 2. Analyze transistor, FET and MOSFET amplifiers 3. Apply the small signal models (tools) to analyze the performance of amplifiers built using BJT. 4. Understand working of power amplifiers.	

[illegible]

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 with 60-70% 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	8 Hrs.
Unit 2: Fourier Series 2.1 Definition, Euler's formulae, 2.2 Dirichlet's conditions, functions having points of discontinuity. 2.3 Change of interval 2.4 Expansion of odd and even periodic functions 2.5 Half range series	8 Hrs.
Unit 3: Fourier Transform 3.1 Fourier integral theorem 3.2 Fourier transforms 3.3 Fourier sine and cosine transforms 3.4 Finite Fourier sine and cosine transforms 3.5 Properties of Fourier transforms	7 Hrs.
Unit 4: Vector Calculus 4.1 Differentiation of vectors 4.2 Velocity and acceleration 4.3 Gradient of scalar point function and Directional derivative 4.4 Divergence of vector point function 4.5 Curl of a vector point function 4.6 Solenoidal and Irrotational vector fields	8 Hrs.
Unit 5: Laplace Transforms 5.1 Definition, transforms of elementary functions 5.2 Properties of Laplace transform 5.3 Transforms of derivative and integral 5.4 Evaluation of integrals using Laplace transform	7 Hrs.

Unit 6: Inverse Laplace Transforms 6.1 Inverse Laplace transforms 6.2 Inverse Laplace transforms by using partial fractions and convolution theorem. 6.3 Transforms of periodic functions and Heaviside unit step function. 6.4 Solution of linear differential equations with constant coefficients by Laplace transform method	7 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 Vidyarthi GrihaPrakashan, 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 Rakesh Dube, Narosa Publishing House.	

Title of the Course: Digital System Design Code: UETPC0303	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 gate and flip flops.
4. Understand principles, characteristics and operations of Logic families and semiconductor memories.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	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	1	2	3	4	5	6	7	8	9	10	11	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
ISE1	10
MSE	30
ISE2	10
ESE	50

ISE1 and 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:-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.	7 Hrs.
Unit 2:-Combinational Logic Design. Design of ALU: adder with look ahead carry generator, Subtractor using adder, 4 bit Magnitude Comparator, barrel shifter, Code converters: BCD to 7segment, decoder, Multiplexer and De-multiplexer, encoder, priority encoder, Static and dynamic Hazards	8 Hrs.
Unit 3:-Sequential Logic Circuits. Flip Flop types, Race around condition in JK flip flop, and improvements, flip flop asynchronous inputs, meta-stability in flip flops, 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.	7 Hrs.
Unit 4:-Applications of Sequential circuits. Shift register: buffer register, controlled buffer register. Data transmission in shift register SISO, SIPO, PISO, PIPO, Bidirectional shift register universal shift register. 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.	8 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. AnandKumar_Fundamentals of Digital Circuits_--.PHI 2. M.MorrisMano_Digital Design_--(Third Edition),.PHI 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 Norman Balabanian, Bradle 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. Explain the operations of logic families and memories.	

Title of the Course: Electronic Instrumentation & Measurement Course Code: UETPC0304										L	T	P	Credit
										3	-	-	3
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.									Cognitive	Apply		
CO2	Select appropriate transducer as per applications.									Cognitive	Knowledge		
CO3	Apply their knowledge to measure electrical quantities using analog and digital measuring instruments.									Cognitive	Apply		
CO4	Explain operation of different instruments and Identify their industrial and laboratory applications									Cognitive	Comprehension		
CO-PO Mapping:													
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1	2	1		1	1	1	1	1			2	2	1
CO2	3	1	2	1	1			1		2	2	2	1
CO3	2					1				1	2	2	1
CO4	3	2			1		1		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 with 60-70% 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												7 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												7 Hrs.	

bridges	
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	7 Hrs.
Unit 4:- Semiconductor Sensors: MEMS sensors, Digital sensors, 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.	7Hrs
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 Designl, TMH, 5th Edition, 2009. 3. H.S.Kalsi, —Electronic instrumentationl, 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 InstrumentationBernard M. Oliver, John M. Cage McGraw Hill Education.	
References: 1. Electronic Instrumentation and Measurement Techniques, Helfrick Cooper. 2. Instrumentation for Engineers andScientists, John Turner, IIEdition, 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: Environmental Studies	L	T	P	Credits
Course Code UETVE0305	2	-	-	2

Course Pre-Requisite: Students shall have knowledge of:

- Basic Science (Physics and Chemistry)

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

Course Learning 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 to 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	Descriptor
CO1	Summarize 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	Interpret environmental ethics and their implementation for betterment of environment and human life.	2	Understanding
CO4	Summarize the requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.	2	Understanding

CO-PO Mapping:

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

CO	PSO1	PSO2
CO1		
CO2	1	1
CO3		1
CO4		1

Assessment Scheme:

ESE: Assessment is based on 100% course content

Assessment Component	Marks
ESE	50

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, dam's 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 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.	5 Hrs.
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, man/wildlife 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 waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.	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.	5 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)

Unit wise Learning Outcomes:

At the end of the course the students will be able to:

UO 1: Describe scope and importance of environmental studies.

UO 2: Describe types of natural resources, their use and conservation.

UO 3: Explain structure and functions of ecosystem, their types and importance.

UO 4: Discuss biodiversity, endangered species and methods of biodiversity conservation.

UO 5: Explain causes, effects and solutions to pollution problems.

UO 6: Discuss environmental ethics and various social issues related to environment.

UO 7: Discuss laws and regulations for conservation of environment.

Title of the Course: Engineering Management Course Code:UETEM0306		L	T	P	Credit								
		2	-	-	2								
Course Pre-Requisite: A working knowledge of Knowledge of English Communication and Discipline Courses.													
Course Description: To develop competencies and abilities to work in an industrial organization by studying of the concepts like planning, organizing, directing, controlling Idea is to change their view from job seeker to job provider by changing their abilities to plan and formulate for the entrepreneurship.													
Course Objectives: 1. To understand various functions of Management. 2. To study and understand the actual predictions made in organization in profit making process by planning material Management and purchase management. 3. To use PERT and CPM methods for project management.													
Course Learning Outcomes:													
CO	After the completion of the course the student should be able to		Bloom’s Cognitive										
			level	Descriptor									
CO1	Explain importance and functions of management.		Understanding	Explain									
CO2	Illustrate marketing, selling, Management and purchase management concepts.		Understanding	Illustrate									
CO3	Illustrate marketing, selling, Management and purchase management concepts.		Understanding	Illustrate									
CO4	Apply cost estimation procedure analysis.		Applying	Apply									
CO-PO Mapping:													
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1										2			
CO2										2			
CO3						2				3			
CO4			2	2		1				2			2
Assessments :													
Teacher Assessment:													
End Semester Examination (ESE) having 100%.													
Assessment			Marks										
ESE			100										
ESE: Assessment is based on 100% course content.													

Course Contents:	
Unit 1: Basics of Management Management - Definition – Administration- Definition – Henry-Fayol's principles of management, functions, importance, levels of management, Business Organization Importance and Principles, Organisation-Types- Proprietorship- Partnership- Leadership -Types – Quality of good leader, Entrepreneurship-importance, Qualities, function of entrepreneur	08 Hrs
Unit 2: Marketing and Costing Marketing and selling concept, marketing mix, Advertising- concept, need, types, advantages and limitations. Material Management– concept, function, Purchase management-concept, objectives, functions, importance, policies and procedure. Elements of cost, cost estimation procedure.	6Hrs.
Unit 3: Human Resources Management: Basic functions of human resource management. Manpower planning, Recruitment, Selection, Training and Development, Placement, Compensation and Performance appraisal.	6 Hrs.
Unit 4:Project Management PERT and CPM Introduction, Project Life Cycle, Project Appraisal , Project Structure ,Terminology used in Project Scheduling ,Project Crashing (Optimization through CPM) ,Resource Levelling	6 Hrs.
Textbooks: 1. P.C. Tripathi, P.N.Reddy, 'Principles of Management' , Fourth Edition, Tata Mc Graw Hill Companies, New Delhi (2008) 2. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publication. 3. Industrial Engineering And Management by Kumar, Pravin Pearson Publication	
References: 1. N. V. S.Raju, Industrial Engineering and Management, Cengage Learning. 2. Nandkumar K. Hukeri, Industrial Management, Electrotech Publications	
Unit wise Measurable students Learning Outcomes: 1. Explain functions, importance, levels of management. 2. Understand concepts of planning material Management and purchase management in the organisation. 3. Understand functions of human resource management in the organisation. 4. Understand use of PERT and CPM methods for project management planning.	

Title of the Course: Analog Circuits Laboratory												L	T	P	Credit
CourseCode:UETPC0331												-	-	2	1
Course Pre-Requisite: Basic knowledge of mathematics, semiconductor physics, Basic Electrical Engineering is required.															
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	Descriptor		
	CO1	Analyze Voltage regulator circuits to meet requirements.										IV	Analyze		
	CO2	Build BJT and FET amplifiers circuits to meet requirements.										VI	Build		
	CO3	Analyze frequency response of BJT and FET amplifiers to meet requirements.										III	Analyze		
	CO4	Evaluate power amplifiers circuits.										V	Evaluate		
CO-PO Mapping:															
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2		
CO1	3	2										1			
CO2		2	3	2								1			
CO3		2	3	2								1			
CO4		1			2							1			
Assessments:															
Teacher Assessment:															
One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.															
ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/Internal oral etc.															
ESE: Assessment is based on oral examination															
Assessment												Marks			
ISE												25			
ESE (POE)												50			

Course Contents:	
Experiment No.1 :--- 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:	2Hrs.
Experiment No. 2:--- 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:	2Hrs.
Experiment No. 3:--- 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:	2Hrs.
Experiment No. 4:--- Aim and Objectives: Design of IC Voltage Regulator using 78XX or 79XX and LM317 or LM723 Outcomes: Student will be able to design Voltage Regulator using 78XX or 79XX and LM317 or LM723 Theoretical Background: Voltage Regulator using 78XX or 79XX and 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:	2Hrs.
Experiment No. 5:--- Aim and Objectives: Calculation of performance parameters using characteristics 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:	2Hrs.
Experiment No. 6:--- Aim and Objectives: To study of single stage common emitter (CE) amplifier. Outcomes: The students will be able to design single stage common emitter (CE) amplifier. Theoretical Background: Theory and operation principle of single stage common emitter (CE) amplifier. Experimentation: Analysis, designing and implementation of single stage common emitter (CE) amplifier. Results and Discussions: Noted output voltage for different frequencies. Conclusion:	2Hrs.

Experiment No. 7:--- 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	2Hrs.
ExperimentNo.8:--- 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 obtain Frequency response of two stage RC coupled amplifier. Results and Discussions: Obtain the band width of RC coupled amplifier Conclusion:	2Hrs.
ExperimentNo.9:--- Aim and Objectives: Design & study of Frequency response of two stages 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 obtain Frequency response of two stage direct coupled amplifier Results and Discussions: Obtain the bandwidth of amplifier and effect of direct coupling Conclusion:	2Hrs.
ExperimentNo.10 :--- 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:	2Hrs.
Textbooks: 1. Electronic Devices and Circuits by A.P.Godse and U.A.Baksh is citech Publication. Electronic Devices and Circuits byAllen Mottershead-PHI Publication 2. A.S.SedraandK.C.Smith, MicroelectronicCircuitsSaundersCollegePublishing,1991. 3. ElectronicDevicesandcircuitsbyS.Salivahanan,NSureshKumar,AVallavarajTMHPublication References: 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. Pulse, Digital & Switching Waveforms by Millman, Taub,Rao. 8. Schaum's Outlines,—Electronic Devices and CircuitsI 9. 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. Compare and contrast** the amplifier circuits implemented using FET.
- 3. Analyze** the performance of Regulators

Title of the Course: Digital System Design Laboratory Course Code: UETPC0332										L	T	P	Credit
										--	--	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 students 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	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(OE)								25					
ISEarebasedonpracticalperformed/Quiz/Mini-Projectassigned/Presentation/Group Discussion/Internal oral etc. ESE: Assessment is based on oral and Practical 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. DesignandimplementS-Rflip-flopandDflip-flopandJKflip-flopusinglogicgates. 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 detect or using Moore Machine b. Sequence detect or 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] WilliamI.Fletcher._AnEngineeringApproachtoDigitalDesign_—PHI/Pearson 2] NormanBalabanianBradleCarlson._DigitalLogicDesignPrincipals,._WileyPublication. 3]Rajkamal _Digital Systems Principals and Design_—Pearson 4] A.P.Malvino,D.P.Leach_ DigitalPrinciples&Applications _-VIthEdition-TataMcGrawHill, Publication. R.P.Jain- _ModernDigitalElectronics _IIIRD Edition-TataMcGrawHill,Publication	

Title of the Course: Electronic Instrumentation & Measurement Laboratory Course Code: UETPC0333		L	T	P	Credit								
		-	-	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.		Cognitive	Apply									
CO2	Select appropriate transducer as per applications.		Cognitive	Knowledge									
CO3	Apply their knowledge to measure electrical quantities using analog and digital measuring instruments.		Cognitive	Apply									
CO4	Explain operation of different instruments and Identify their industrial and laboratory applications		Cognitive	Comprehension									
CO-PO Mapping:													
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1	2	1		1	1	1	1	1			2	2	1
CO2	3	1	2	1	1			1		2	2	2	1
CO3	2					1				1	2	2	1
CO4	3	2			1		1		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													
ISE													
Marks													
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													
2Hrs.													

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.	2Hrs.
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	2Hrs.
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	2Hrs.
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: Lissajous figure is a stable pattern that is obtained by 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, $FV = FH * (TH / TV)$ $\text{Phase angle } \theta = \sin^{-1} YHY / YM.$ Conclusion: Thus we can measure frequency and phase by observing Lissajous pattern on DSO.	2Hrs.
Experiment No. 6:--- Aim and Objectives: Study of linear displacement measurement using linear	2Hrs.

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	
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.	2Hrs.
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.	2Hrs.
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.	
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.	2Hrs.
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 Designl, 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: Mini Project -I										L	T	P	Credit	
Course Code: UETIL0371										-	-	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 find innovative solutions to industrial / engineering problem / simplify human life.														
Course Objectives:														
1. Evaluate social needs.														
2. Identify suitable problem that can be solved using first year engineering knowledge and basic knowledge of electronics engineering and programming.														
3. Design and implement the solution using hardware / software or both														
4. Testing of the implementation														
5. Write project report as per standard format														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom_s Taxonomy			
											level	Descriptor		
CO1	Identify social problem that can be implantable using the principles of science, engineering and skills like CAD Tools, Programming and basics of electronics.										III	Identify		
CO2	Analyze, Design and 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	PSO1	PSO2	
CO1	3	2	2	2	2							2	1	
CO2	2	3	3						2		2	2	2	
CO3	1													
CO4					2			3	3		2			
Assessments:														
Teacher Assessment:														
One component of In Semester Evaluation (ISE).														
Assessment										Marks				
ISE										50				
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 application of science and engineering in innovative manner.
- The group of four students should identify social/ engineering problems, perform requirement analysis.
- After interactions with course coordinator and based on comprehensive literature survey/needanalysis, the student shall identify the title and define the aim and objectives of project.
- As per requirements the group should develop specifications of final outcome of the project.
- The students should think critically and undertake design of the project with skills available with 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 the proposal within first week of the semester.
- The student is expected to exert on design, development and testing of the proposed work as per the schedule.
- The working model of the project should be demonstrated for internal submission.
- Completed project and documentation in the form of project report is to be submitted at the end of semester. The project should complete in 12 weeks.
- At the end of project, the guide should advise students to write the project phase – 1 report and publish paper on work completed or participate in project competition

The probable areas of the project work (but not only restricted to):

Environment protection, global warming, safe drinking water, waste management, renewable energy utilities, biomedical engineering, accident prevention, enabling weaker section of society, efficiency / cost / time improvements, human hardship prediction, prosthesis, smart city, smart transportation, Pandemicprevention 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 four** 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 each group), 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. Design Calculations
 3. Simulation using appropriate EDA tool (NI Multisim / Orcad / Pspice / AltiumDesigner suite etc.)
 4. Component Selection
 5. Hardware implementation: PCB design / Assembling/ Testing/Calibration
 6. Conclusion.
 7. Report preparation
 8. Final Presentation and demonstration

Textbooks:

1. Measurement, Instrumentation, and Sensors Handbook, John G. Webster, CRC Press, 1999.
2. Printed Circuit Boards: Design, Fabrication, and Assembly, R. Khandpur, McGraw-Hill, 2005
1. SPICE for Circuits and Electronics Using PSPICE Paperback – August 1994 by M.H. Rashid

References:

1. Practical design of power supplies, Ron Lenk, John Wiley & 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.electronicshobby.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/>

SEM-II

Title of the Course: Network Analysis	L	T	P	Credit
Course Code: UETPC0401	2	-	-	2

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

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

Course Objectives:

The course aims to:

- 1) Study various types of network theorems for network analysis.
- 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 different types of Filters.

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 dependant voltage sources current sources and analyze the R-L-C circuits using network theorems.	Understanding	Illustrate
CO2	Determine two port network parameters viz Z, Y, ABCD, H and their interrelationships.	Evaluating	Determine
CO3	Evaluate series resonance and parallel resonance frequency half power frequencies BW Q factor etc.	Evaluating	Evaluate
CO4	Identify the type of transient system.	Applying	Identify
CO5	Analyze Constant K-type filters.	Analyzing	Analyze

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	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 EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ESE	100

Minimum passing required is 40 marks.

Course Contents:	
Unit 1:--- Development of Basic Circuit Concepts And Graph Theory: Series and parallel circuit, 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.	04 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.	05 Hrs.
Unit 3:--- Two Port Network 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.	05 Hrs.
Unit 4:--- Resonance: Introduction to AC circuit, steady state analysis of RL, RC and RLC circuits, Series resonance: Properties, Bandwidth, Q factor. Parallel resonance: Properties, Bandwidth, Q factor.	06 Hrs.
Unit 5:--- Filters: Introduction, Classification, filter fundamental such as attenuation constant, phase shift, propagation constant, characteristic impedance. Design of K-type Low and High type Filter.	06 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	04 Hrs.
Textbooks: 1) A. Sudhakar ,Shyammohan S.Palli _Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication (Unit II,IV,VI) 2) A.Chakrabarti _Circuit Theory (Analysis & Synthesis)' - III rd 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)	
Reference Books: 1) William H Hayt, Jack E Kimmerly and Steven M.Durbin, Engineering Circuit Analysis, Tata McGraw Hill 2) M.E.Van Valkenburg _ Network Analysis' – IIIrd Edition , Pearson Education / PHI 3) Josheph Edministrar _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 basics of circuit analysis. 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.
- 6) Identify and study the type of transient system.

Title of the Course: Signals and Systems Course Code: UETPC0402										L	P	Credit	
										2	-	2	
Course Pre-Requisite: Engineering Mathematics, Network Analysis: Elementary signals.													
Course Description: In modern age of technology, signals and systems play vital roles. It is core subject in electronics and telecommunication field with diverse applications in area of science and technology such as signal and image processing, communications, control systems, circuit design etc. This course focuses on analysis of signals and systems using various transforms.													
Course Objectives: On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models to be able to apply them to the analysis and design of digital and analog communications and control systems. The students will be able to perform signal analysis with reference to spectrum analysis of deterministic and non-deterministic signals.													
Course Learning Outcomes:													
CO	After the completion of the course the student should be able to								Bloom's Cognitive level		Descriptor		
CO1	To apply skills to solve problems related to system classification & its properties								II		Explain		
CO2	To know the Fourier series & Fourier Transforms for representation of periodic and non periodic signals .								III		Applying		
CO3	To analyze the systems in time & frequency domain by applying knowledge of Z Transforms								III		Applying		
CO-PO Mapping:													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			1					2		2	
CO2	3	3				2		2					2
CO3	3	3				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:-Introduction to Signals and Systems Introduction, standard signals, signal representation, classification of signals, System Representation, continuous & discrete systems, properties of system.											5 Hrs.		
Unit 2: Linear time invariant Systems The representation of signals in term of impulses, discrete time LTI systems, continuous time LTI systems, properties of CT-LTI and DT-LTI systems,											6Hrs.		

Convolution integral and convolution sum, graphical representation of convolution.	
Unit 3:- Sampling Representation of continuous time signals by its samples, The sampling theorem, Reconstruction of signals from its samples using interpolation, The effect of under sampling, aliasing, Discrete time processing of continuous time signals, Sampling in the frequency domain.	5 Hrs.
Unit 4: Fourier Domain Analysis Signals: Continuous time Fourier Series : Trigonometric Fourier series, Exponential Fourier series, relation between trigonometric and exponential Fourier series, properties of Fourier series. Fourier transform, Fourier transform pair, Fourier spectra, Convergence of FT, properties of Fourier transform.	8 Hrs.
Unit 5: Z Transform : Introduction of Z transform, ROC, properties of ROC, Unilateral Z-transform, properties of Z transform, Inverse Z transform : long division method, PFE method, residue method, Transfer function (Poles & Zeros).	6 Hrs.
Textbooks: 1 A.V. Oppenheim, A.S. Willsky, S.H. Nawab, <i>Signals and Systems</i> , Prentice Hall, 1997. 2. B. P. Lathi, —Linear Systems and Signals, OXFORD University Press 3. Ashok Ambardar, <i>Analog and Digital Signal Processing</i> , CL Engineering, 1999 4. Digital Signal Processing Principles, Algorithms and Application – By John G Prokis, Manolakis, Pearson Education publication	
References: 1. B. P. Lathi, <i>Linear systems and signals</i> , Oxford University press, 2005 2. M. J. Roberts, <i>Signals and systems</i> , Tata Macgraw Hill, 2005 3. Simon Haykin, Barry Van Veen, <i>Signals and systems</i> , Wiley, 2003 Hwei P Hsu, <i>Schaum's Outline Signals and Systems</i> , Tata Macgraw Hill, 1995 4. Digital Signal Processing P. Ramesh Babu, Scitech publication	
Unit wise Measurable students Learning Outcomes: 1. Understand fundamental characteristics of Signals and Systems. 2. Analyze response of linear continuous-time and discrete-time signals and systems. 3. Apply time-domain and frequency-domain analysis tools to linear continuous systems. 4. Analyze discrete-time signals and system responses using the concepts of transfer function representation by use of Z and inverse-Z transforms. 5. Analyze signals using Discrete Fourier Transform (DFT)	

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.	8 Hrs
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.	6 Hrs
Unit: 3. Noise: Different 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.	6 Hrs
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.	8 Hrs
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.	8 Hrs
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).	7 Hrs
Textbooks: 1) George Kennedy, —Electronic Communications, McGraw Hill. 2) Wayne Tomasi _Electronics Communication System' -Fundamentals through Advanced. – 5 th 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' 2 nd Edition –Tata McGraw Hill Publication. 4) Louis E. Frenzel, Principles of Electronic Communication System, 3 rd Ed., TMH Publication.	
Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

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

Unit1:---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).	7 Hrs.
Unit2:---OP-Amp Characteristics Block Diagram of Op-Amp, Ideal & Practical Op-amp specifications, Transfer characteristics of Op-amp, Op amp parameters & measurement: Input & output offset voltages, Input & output offset currents, Input Bias current, slew rate, CMRR, PSRR, Thermal drift	7 Hrs.
Unit3:--Negative Feedback In Op-Amps: Open Loop & closed Loop- Inverting, Non-Inverting and Differential (Using one op-amp). Analysis for A_v , R_i , R_o , 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.	7 Hrs.
Unit4:---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.
Unit5:---Active Filters First & Second Order Butterworth Low Pass, High Pass ,Band Pass, Band Reject & All Pass Filters (Analysis & Numericals are Expected).	6 Hrs.
Unit6:---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).	8 Hrs.

Title of the Course: Electromagnetic Engineering Course Code: UETPC0405					L	T	P	Credit					
					3	-	-	3					
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's equations 4. Students describe, recognize and manipulate plane electromagnetic waves in dielectric and con- ducting 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 transmission line. 2. Students will be able to understand the basic concepts of electromagnetic engineering 3. Able to analyze the parameters of plane waves and transmission lines.													
CO	After the completion of the course the student should be able to							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		Analyzing			
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1											
CO2	2	2		1									
CO3	1	2											
CO4	2	1	2		1							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						

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 with 60-70% Weightage for course content (normally last three modules) covered after MSE.	
Course Contents:	
Unit 1:--- Co-ordinate systems Review of vector Analysis, vector algebra, Point and vector transformation, del operator, Cartesian, Cylindrical and spherical coordinate systems, Coulomb's law, electromagnetic spectrum. (Numerical expected)	8 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)	8 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, vector magnetic potential, Stoke's Theorem. (Numerical expected)	8 Hrs.
Unit 4:--- Maxwell's Equations Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, time varying field & harmonically varying fields, Capacitance of simple configurations, Comparison of field & circuit theory.	5 Hrs.
Unit 5:--- Electromagnetic Waves Wave propagation in free space, dielectric & conducting media, Modification in wave equations for sinusoidal time variations, Characteristics of plane wave in a) pure dielectric media, b) Conducting media, Reflection of electromagnetic wave for normal incidence, Polarization, skin depth, Poynting theorem. (Numerical expected)	8 Hrs.
Unit 6:--- Transmission Lines Types of transmission lines, equivalent circuit, Transmission line equations, primary and secondary constants of transmission line, Transmission line parameters, terminated uniform transmission line, Short circuited and open circuited line, Reflection coefficient, VSWR, Smith chart. (Numerical expected)	8 Hrs.
Textbooks: 1. John D. Kraus, Electromagnetics, Tata McGraw-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. R K Shevgaonkar, Electromagnetic waves –Tata mc-Graw Hill 1st Ed, 2005. 5. W H Hayt and J A Buck, Problems and Solutions in Electromagnetics Tata mc-Graw Hill	
References: 1] William Hayt, Buck, —Engineering Electromagnetics, Mc Graw Hill. 2] E. C. Jordan & K. Balmain, Electromagnetic Waves and Radiating Systems, 2nd edition, PHI. 3] David K. Cheng, Field and Wave Electromagnetics, Pearson Education. 4] Kraus & Fleisch, Electromagnetics with Applications, 5th Edition, McGraw Hill International Edition	

Unit wise Measurable students Learning Outcomes:

1. **Comprehend** the principles of electric and magnetic field. (L1, L2 and L3)
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 a report based on survey of effects of radiation (EMI) from cell phone, transmitters, antennas etc.

Title of the Course: Constitution of India											L	T	P	Credit	
Course Code: UETVE0406											2	-	-	2	
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	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	PSO1	PSO2		
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						
ISE									50						
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													(10) Hrs.		
2.1 : Fundamental Rights & Fundamental Duties															
2.2 : Directive Principles of State Policy															
Unit 3:- Union Government & Executive													(04) Hrs.		
3.1 : President of India – Qualification, Powers and Impeachment															
3.2 : Lok Sabha & Rajya Sabha Sabha- Composition, Powers & Functions, Scope to amendment in Constitution															
Unit 4:- State Government & Executive													(03) Hrs.		
4.1 : Governor – Qualification, Appointment, Powers & Functions															
4.2 : Legislative Assembly & Legislative Council – Composition, Powers & Functions															

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	

Title of the Course: Analog and Digital Comm. Laboratory	L	T	P	Credit
Course Code: UETPC0431	0	0	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 modulation techniques.
2. Describe & demonstrate different types of demodulation techniques.
3. Live Demonstration at AIR station of AM or FM transmission.
4. Describe & demonstrate different types of baseband transmission and modulation techniques.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Define different types of noise and their classification.	Remembering (I)	Define
CO2	Explain different modulation schemes.	Understanding(II)	Illustrate
CO3	Explain different Demodulation schemes.	Understanding(II)	Illustrate
CO4	Understand the baseband transmission and Reception.	Analyzing (IV)	Distinguish

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1	1								2		1		
CO2	1	3	1	2			1		2		1	2	
CO3	1	3	1	2			1		2		1	2	
CO4		3	1	2					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(POE)	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.

2Hrs.

Experimentation: Results and Discussions: $m = E_m/E_c$ 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.	
Experiment No. 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: $m = (V_{max} - V_{min}) / (V_{max} + V_{min})$ 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.	2Hrs.
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.	2Hrs.

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 Modulators. Diode, rectifier, filter, working of varactor diode. Results and Discussions: Modulation index = $(f_2 - f_1) / f_m$ Conclusion: In FM, frequency of the carrier signal is changed according to instantaneous value of modulating signal.	2Hrs.
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: Nyquist criteria are satisfied to avoid aliasing. Nyquist criteria is $f_s > 2 * f_m$. Conclusion: Sampling theorem states that, it is possible to convert continuous signal into discrete signal and recovered back the original signal if the condition $f_s > 2 * f_m$ is satisfied otherwise aliasing means merging one frequency into another is occurred.	2Hrs.
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 a switch 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.	2Hrs.
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	2Hrs.

modulating signal.	
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: 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).	2Hrs.
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 their knowledge.	2Hrs.
Experiment No. 10:--- Aim: Study of ASK transmitter and receiver. Objectives: Demonstrate working of ASK. Outcomes: Observed waveforms at different stages. Theoretical Background: Working of transistor and OP-AMP. Results and Discussions: See why ASK is called as OOK. Conclusion: We are getting output when 1 is transmitted and we are not getting output when 0 is transmitted.	2Hrs.
Experiment No. 11:--- Aim: Study of FSK transmitter and receiver. Objectives: Demonstrate working of FSK. Outcomes: Observed waveforms at different stages. Theoretical Background: Working of transistor and OP-AMP. Results and Discussions: See how frequency changes from high to low. Conclusion: We are getting high frequency when 1 is transmitted and we are getting low frequency when 0 is transmitted.	2 Hrs
Experiment No. 12:--- Aim: Study of PSK transmitter and receiver. Objectives: Demonstrate working of PSK. Outcomes: Observed waveforms at different stages. Theoretical Background: Working of synchronous demodulator and OP-AMP. Results and Discussions: See how phase changes from 0^0 to 180^0 . Conclusion:	2 Hrs

We are getting 0° phase shift when 1 is transmitted and we are getting 180° phase shift when 0 is transmitted.	
Experiment No. 13:--- Aim: Study of different Data formats. Objectives: Demonstrate generation of different data formats like Unipolar RZ, Unipolar NRZ, Bipolar RZ, Bipolar NRZ, AMI and Manchester Code. Outcomes: Observed waveforms for different line Codes. Theoretical Background: Working of different logical Gates like AND, EX-OR, EX-NOR etc. Results and Discussions: Observe different waveforms. Conclusion: We differentiate the difference different Line Codes.	2 Hrs
Textbooks: 1) George Kennedy, —Electronic Communications, McGraw Hill Kennedy.. 2) Wayne Tomasi _Electronics Communication System‘ -Fundamentals through Advanced.-Vth 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‘ IInd Edition –Tata Mc Graw Hill Publication. 4) Louis E. Frenzel, —Principals of electronic communication system, IIIrd Ed., TMH Pub.	
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 different data formats.	

Title of the Course: Linear Integrated Circuits Laboratory	L	T	P	Credit
Course Code:UETC0432	-	-	2	1

Course Pre-Requisite:

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	Cognitive	Evaluate
CO2	Design linear and non-linear applications like rectifier, active filters, signal generators using op-amp.	Cognitive	Create
CO3	Design the application of timer IC 555 for multivibrator	Cognitive	Create
CO4	To test the simulation of Op-amp circuits.	Cognitive	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1											
CO2			3								2	2	
CO3			3							2		2	
CO4					3							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(POE)	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 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 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,	2 Hrs.

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 +V _{sat} to -V _{sat} & -V _{sat} to +V _{sat} 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:- 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	2 Hrs

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 implement 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 be 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: Mini Project – II
Course Code: UETIL0471

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

Course Description: Course will cover all the implementation of theoretical design & its practical implementation.

Course Objectives:

1. Design working, reliable and electronic circuits to meet specifications.
2. Inculcate circuit designing skills and ability and to use modern design tools.
3. Enhance employability based on knowledge and understanding of Microcontrollers, Arduino programming with C++ & python programming with Raspberry Pi
4. To create interest in the field of electronic design as a prospective career option.

Course Learning Outcomes:

1. Design working, reliable and electronic circuits to meet specifications.
2. Inculcate circuit designing skills and ability and to use modern design tools.
3. Enhance employability based on knowledge and understandings Microcontrollers, Arduino programming & python programming with Raspberry Pi
4. To create interest in the field of electronic design as a prospective career option.

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Identify a problem statement from literature survey or social and industry requirements.	III	Applying
CO2	Design a solution for the identified problem by applying acquired technical knowledge.	VI	Creating
CO3	Demonstrate and Test the Prototype with a standard solution/ process.	II	Understanding
CO4	Apply time and team management skills for completion of project.	III	Applying

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	1			1				2	2	1	1	1	1
CO2		2	3	1				2	2	1	1		
CO3				1	3		1	2	2	1	1		
CO4				1				2	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

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

Guidelines:

1. The mini project-II is a team activity having 4 students in a team. This is electronic product design work with a focus on electronic circuit design.

2. The mini project may be a complete hardware or a combination of hardware and software.
3. Mini Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/ Industry requirements analysis, the student shall identify the title and define the aim and objectives of mini project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development, and testing of the proposed work as per the schedule.
8. Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
9. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

Textbooks:

1. Measurement, Instrumentation, and Sensors Handbookl, John G. Webster, CRC Press,1999.
2. Exploring Arduino: Tools and Techniques for Engineering Wizardry book by Jeremy Blum
3. Raspberry Pi 3: Beginner to Pro - Step by Step Guide book by Timothy Short
4. The 8051 Microcontroller and Embedded Systems Book by Muhammad Ali Mazidi.
5. Complete PCB Design Using OrCAD Capture and PCB Editor by Kraig Mitzner- Newnes publication

Title of the Course: Electronics Computer Aided Design (E-CAD) Course Code: UETVS0433	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite:

1. Basic computer operations, GUI based PC software operations.
2. Understanding of Linear Network components and theorems KVL, KCL.
3. Knowledge of Basics Semiconductor components and characteristics

Course Description:

Analysis and design of RC, RL,RLC electrical networks and semiconductor devices, Sinusoidal steady state analysis of passive networks, mesh and nodal analyses, Noise analysis, Kirchhoff's Laws, Analysis of Circuits with a Dependent Source using various types of Analysis i.e. Bias point, Time domain, AC Sweep, DC Sweep, Parametric, Monte Carlo simulations.

Course Objectives:

The course aims to:

- 1 Provide an introduction to P-Spice & simulation software tools (like OrCAD / Proteus, MultiSim).
- 2 Develop the ability to analyze electronic circuits using simulation software for their AC & DC analysis.
- 3 Develop skills to design PCB as per required specification using CAD tools.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Analyze components associated with modeling and simulation of electronic systems.	4	Analyze
CO2	Demonstrate proficiency in the use of appropriate equipment and devices for simulation of electronic circuit.	2	Demonstrate
CO3	Analyze electronics devices and circuits using computer simulations.	4	Analyze
CO4	Design/model and troubleshoot of electronic systems.	5	Design
CO5	Create a feasible and efficient PCB layout of the given circuit using software.	5	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1		3										1	
CO2	2				2								2
CO3		2											
CO4			3		3								2
CO5			3		2								2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE) having 50% and 50% weights respectively.

Assessment	Marks
ISE	25

ISE are based on LAB assignments conduct and record writing etc.

Course Contents:

Unit 1. Electronics Components and specifications :

Study of datasheets, Types, mechanical and electrical Specification and Ratings of resistors, capacitors, switches and connectors, diodes, Transistors, FET, MOSFETS etc.

Unit 2. Introduction, Description of P-Spice and OrCad, Types of analysis, Description of simulation software tools (like OrCAD / PROTEL / Proteus / Multisim) Schematic Description: Introduction, Input files, element values, Nodes, circuit elements, sources, output variables, format of circuit and output files, drawing the schematic, Design rule Check (DRC), Netlist

details
Unit 3. Circuit Elements: Voltage and Current, Electrical Resistance, Ohm's law, Model Circuit, Types of Analysis: Bias point, Time domain, AC Sweep, DC Sweep, Parametric, Monte Carlo, Noise analysis, Kirchhoff's Laws, Analysis of Circuits with a Dependent Source
Unit 4. Characteristics of Electronics devices: Input, output and transfer characteristics of Diode, BJT, FET, MOSFET.
Unit 5. Simple Resistive Circuits: Resistors in Series, Resistors in Parallel Simple Resistive Circuits: The Voltage-Divider Circuit, The Current-Divider Circuit, Measuring Voltage and Current, The Wheatstone Bridge. Techniques of Circuit Analysis: Introduction to the Node-Voltage Method, The Node-Voltage Method and Dependent Sources, The Node-Voltage Method: Some Special Cases.
Unit 6. Techniques of Circuit Analysis: Introduction to the Mesh-Current Method, The Mesh-Current Method and Dependent Sources, The Mesh-Current Method: Some Special Cases, The Node-Voltage Method versus the Mesh-Current method.
Unit 7. Techniques of Circuit Analysis: Source Transformations, Thevenin and Norton Equivalents, Maximum Power Transfer, Superposition theorems. Amplitude and Frequency modulation, spectrum representation of Amplitude and frequency modulation
Unit 8. Inductors and Capacitors: The Inductor, The Capacitor, Series-Parallel Combinations of Inductance and Capacitance.
Unit 9. Filters: HPF, LPF, BPF, BSF frequency response. Magnitude and Phase Plots.
Unit 10. Response of First-Order RL and RC Circuits: The Natural Response of an RL Circuit, The Natural Response of an RC Circuit.
Unit 11. Frequency Response of First-Order RL and RC Circuits: The Step Response of RL and RC Circuits, A General Solution for Step and natural Response
Unit 12. Natural and Step Response of RLC Circuits: The Natural Response of a Parallel RLC Circuit, The Step Response of a Parallel RLC Circuit
Unit 13. Natural and Step Response of RLC Circuits: The Natural Response of a Series RLC Circuit, The Step Response of a Series RLC Circuit
Unit 14. Sinusoidal Steady-State Analysis: The Sinusoidal Source, The Sinusoidal Response, The Passive Circuit Elements in the Frequency Domain, Kirchhoff's Laws in the Frequency Domain
Unit 15. Sinusoidal Steady-State Analysis: Series and Parallel Simplifications, Source Transformations and Thevenin-Norton Equivalent, The Node-Voltage Method, The Mesh-Current Method, Transformers building using inductors .
Unit 16 PCB Design: IC packages, Types of Connectors, Netlist for layout, Types of PCB's, Description of layout design tool, foot- print creation, Setting board parameter (board template, layer strategies), Component placement considerations, Routing strategies, Design Rule check, back annotation, post processing reports.
Note: Minimum 20 Experiments / Lab assignments must be conducted from the Above topics using the CAD TOOLS like Spice, OrCAD – Pspice , Layout / Proteus/ Multisim etc.
Textbooks: 1. M. H. Rashid _Introduction to P-spice using OrCAD for circuits and Electronics' –Pearson Education
References: 1 . User manuals of PROTEL, PROTEUS, OrCAD, Microcap,Multisim. 2. W.C. Bosshart _Printed Circuit Boards-Design & Technology'–Tata McGraw-Hill Publication

Title of the Course: Co-Curricular Activities- II Course Code: UETCC0434		L	T	P	Credits
		---	---	2	01
Course Pre-Requisite: None: This course is open to all second-year engineering students interested in enhancing their personal and professional development through co-curricular activities.					
Course Description: Co-Curricular activities are an integral part of curriculum which provides educational activities to the students and thereby help in broadening their experiences. Co-Curricular activities can be defined as the activities that enhance and enrich the regular curriculum during the normal college hours. All Co-Curricular activities are organized with specific purpose which may according to the nature and form of activities. This course introduces students to a variety of co-curricular activities aimed at enhancing their professional and personal development within the field of engineering and technology. Through practical projects, competitions, workshops, and community engagement, students will develop teamwork, leadership, communication, and technical skills essential for success in their careers.					
Course Learning Objectives(CLOs): 1. To encourage students to show case their intellectual and independent thinking skills. 2. To imbibe a sense of confidence and managerial capabilities among students. 3. To promote the ability to work in team, organize and analyse available resources. 4. To build responsiveness among students about the social and cultural responsibilities.					
Course Outcomes (COs): At the end of the course students will be able to:					
CO1 :	Demonstrate the ability to critically analyse information and apply independent judgment in decision-making within the context of the activity.				
CO2 :	Apply principles of management and organizational skills to plan, coordinate, and execute tasks related to the co-curricular activity.				
CO3 :	Collaborate effectively with peers to achieve common goals and objectives within the co-curricular activity.				
CO4 :	Reflect on their roles and responsibilities as members of a diverse community, fostering empathy and inclusivity.				
Assessments:					
		Assessment		Weightage (Marks)	
		ISE		30	
ISE: Assessment is based on the student's participation in various Co-Curricular Activities and Guidelines given in —Rules for Assigning Activity Points: Activity – Event Grade Point Scheme Policy Document.					
Course Guidelines:					
1. Students are entitled to gain academic knowledge in this fast-paced environment, but it is also necessary for them to develop their personalities in both internal and external situations. 2. Co-curricular activities help students grow and develop their personalities. These activities contribute to a student's total personality development. 3. Not every student is intellectually inclined. Similarly, not all pupils are interested in co-curricular activities. Therefore, there is a need to provide a solid balance of co-curricular and extra-curricular activities in order to achieve the course learning objectives. 4. It primarily refers to intellectual, physical, emotional, and social growth that can be attained by a careful mix of academic, co-curricular, and extra-curricular activities. 5. So, keeping the course learning objectives the— Rules for Assigning Activity Points: Activity– Event Grade Point Scheme Policy Document is proposed.					

6. Student participation is assessed and reflected in the final activity performance report in order to get most students involved in extra-curricular activities (GroupA) and co-curricular activities(GroupB) as shown in Table 1 in the Policy Document.
7. All undergraduate students must choose at least ONE activity/event from each group i.e. (GroupA and B).
8. Students shall choose one activity/ event from Group A and One from Group B that take place on-campus or off-campus.
9. Freedom shall be given to the students to take part in more than one activity under the group.
10. Students are expected to actively participate in activities, participate in on tests, and earn grade points.
11. One student in each group must earn up to 50 grades in one semester so that they can achieve up to 100 grades in one year.
12. Grades for each semester are awarded based on the points achieved by the student, as shown in Table 2 in the Policy Document.

Course Structure: (Refer Rules for Assigning Activity Points: Activity–Event Grade Point Scheme)

Sr.No.	Initiatives	Criteria, Activities and Assignments
1	Introduction to Co-Curricular Activities	Orientation, Induction, Course Overview
2	National Initiatives Participation	Participation, Achievement Levels and Assigned Activity Points in NCC, NSS, Unnat Bharat/ Unnat Maharashtra Abhiyan, Ek Bharat Shreshtha Bharat (EBSB)
3	Sports and Games Participation	Participation, Achievement Levels and Assigned Activity Points in Sports and Games
4	Cultural Activities Participation	Participation, Achievement Levels and Assigned Activity Points in Music, Performing Arts, Literary Arts
5	Professional Self Initiatives	Participation, Achievement Levels and Assigned Activity Points in 1. Technical Events/Quiz/Paper Contest/Project Contest/Model Making etc. 2. MOOC/NPTEL/SWAYAM/Coursera etc. 3. Competitions/Events Conducted by Professional Societies (ISTE, IEL, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.) 4. Attending Fulltime Conference/Seminars/Exhibitions/Workshop/STTP Conducted at IITs/NITs/Reputed Institutes/Universities 5. Attending Fulltime Conference/Seminars/Exhibitions/Workshop/ STTP Conducted at KITCoEK 6. Paper Presentation in National/ International Conference of High Repute 7. Poster Presentation in National/ International Conference of High Repute 8. Paper Publication in National/International Journal of High Repute 9. Industrial Training/Internship(at least for 04 Weeks) 10. Participation in Institute Level Student Clubs
6	Entrepreneurship and Innovation	Participation, Achievement Levels and Assigned Activity Points in 1. Prototype Developed and Tested 2. Awards for Products Developed 3. Innovative Technologies Developed and Used by Industries 4. Got Funding from Government/ Industry for Innovative Ideas

		5. Patent-Filed/Published/Approved/ Licensed 6. Social Innovations
7	Leadership & Management of Clubs/ Activities	Participation, Achievement Levels and Assigned Activity Points in 1. Elected Student Representative of Student Council (University Representative, General Secretary, Cultural, Sports, NSS Secretary, Ladies Representative, Academic Toppers, Invitee Members) 2. Office Bearer of Professional Society Chapter (ISTE, IET, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.) 3. Office Bearer of Institute Level Student Club (Developer Student Club, Gaganvedhi, Walk With World, Team Mavericks, Cultural Club, Aura, Amateur Write Club, Rotaract Club of KIT Sunshine, Women Development and Gender Equality Cell, Shourya, LeadIndia etc.) 4. Office Bearer of Departmental Student Association 5. Office Bearer of E7 Cell, Digital Content Lab etc. 6. Student Ambassador for Mayura AICTE IDEALab/NIDHI iTBI etc. 7. Editorial Board Member of Annual Magazine 8. Editorial Board Member of E-Newsletter 9. Member of Governance Committee/Statutory Committee
8	Culminating Event and Reflection	Final Presentations, Course Reflection, Documentation, Assessment and Evaluation

Participation Levels:

1. Level: I College Level Events
2. Level: II District/Central/Zonal Level Events
3. Level: III State Level Events
4. Level: IV National Level Events
5. Level: V International Level Events

Approval Documents:

1. Certificate
2. Letter from Authorities
3. Appreciation recognition letter
4. Documentary evidence
5. Legal Proof

Grading Scheme:

Grade Range	Grade	Academic Performance
90-100	A+	Outstanding
71 to 90	A	Excellent
68-71	B+	Very Good
65-68	B	Good
60-65	C+	Average
55-60	C	Below Average
50-55	D	Marginal
<50	F1	Fail due to Poor Performance

Multi Disciplinary Minor Minor Degree in Cyber Security

Title of the Course: Information Theory for Cyber Security Course Code: UETMM0341											L	T	P	Credit
											2	-	-	2
Course Pre-Requisites: Probability Theory, Computer Networks.														
Course Description: Cyber security course is designed to help learners to develop understanding of threats to information system and basic concepts of cyber security. Also they will get exposure to cybersecurity policies and standards including cyber terrorism and cyber forensics.														
Course Objectives: The objective of this course is to provide an insight to information coding techniques, error correction mechanism for cyber security.														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom's Cognitive			
											level	Descriptor		
CO1	Understand probability theory in terms of cyber security										2	Understand		
CO2	Outline different types of cyber attacks and encryption										3	Apply		
CO3	Describe the process of scanning and testing the network										4	Analyze		
CO4	Explain security policies, standards ,cyber terrorism and cyber forensics concepts										3	Apply		
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	1					2	3		1		3	1		
CO2	1				1	2	3		1		3	3		
CO3	1				1	2	3		1		3	3		
CO4	1				1	2	3		1		3	3		
Assessments :														
Teacher Assessment:														
ESE: Assessment is based on 100% course content .														
Course Contents:														
Unit 1: Probability Theory & Cyber Security Shannon's foundation of Information theory, Random variables, Probability distribution factors, Uncertainty/entropy information measures, Leakage, Quantifying Leakage and Partitions, Lower bounds on key size: secrecy, authentication and secret sharing. provable security, computationally-secure, symmetric cipher.												5 Hrs.		
Unit 2: Security & Block Codes Secrecy, Authentication, Secret sharing, Optimistic results on perfect secrecy, Secret key agreement, Unconditional Security, Quantum Cryptography, Randomized Ciphers, Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques.												5 Hrs.		

Unit 3: Cyber attack Information-theoretic security and cryptograph, basic introduction to Diffie-Hellman, AES, and side-channel attacks.	5 Hrs.
Unit 4: Source Coding for Security Secrecy metrics: strong, weak, semantic security, partial secrecy, Secure source coding: rate-distortion theory for secrecy systems, side information at receivers, Differential privacy, Distributed channel synthesis.	5Hrs
Unit 5: Cyber Detective and Forensics Digital and network forensics, Public Key Infrastructure, Light weight cryptography, Elliptic Curve Cryptography and applications.	5Hrs
Unit 6: Security Policies What Is a Policy, Important Standards, User Policies, Security breaches and access control, Disaster recovery, Zero Trust and Important Laws	4 Hrs
Textbooks: 1. Information Theory and Coding, Muralidhar Kulkarni, K S Shivaprakasha, John Wiley & Sons. 2. Communication Systems: Analog and digital, Singh and Sapre, Tata McGraw Hill.	
References: 1. Fundamentals in information theory and coding, Monica Borda, Springer. 2. Information Theory, Coding and Cryptography R Bose. 3. Multi-media System Design, Prabhat K Andleigh and Kiran Thakrar.	

Title of the Course: Data Encryption Course Code: UETMM0441										L	T	P	Credit	
										3	-	-	3	
Course Pre-Requisites: Linear Algebra, Cryptography.														
Course Description: Encryption is used to protect data from being stolen, changed, or compromised and works by scrambling data into a secret code that can only be unlocked with a unique digital key. Encrypted data can be protected while at rest on computers or in transit between them, or while being processed, regardless of whether those computers are located on-premises or are remote cloud servers.														
Course Objectives: This course will cover the concept of security, types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression.														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom's Cognitive			
											level	Descriptor		
CO1	Understand Data Encryption Techniques.										2	Understand		
CO2	Outline diferent types of Message Authentication.										3	Apply		
CO3	Describe the process of scanning and testing the network.										4	Analyze		
CO4	Explain Data compression & Entropy coding.										3	Apply		
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	1					2	3		1			1		
CO2	1				1	2	3		1			3		
CO3	1				1	2	3		1			3		
CO4	1				1	2	3		1			3		
Assessments :														
Teacher Assessment:														
ESE: Assessment is based on 100														
Course Contents:														
Unit 1: Security & Encryption Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks. Encryption Techniques: Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.												8 Hrs.		
Unit 2: Symmetric & Asymmetric Key Cryptography Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm.												8 Hrs.		
Unit 3: Case Study & Message Authentication Case Studies of Cryptography: Denial of service attacks, IP spoofing attacks, Conventional Encryption and Message Confidentiality, Conventional Encryption Algorithms, Key Distribution. Public Key Cryptography and Message Authentication: Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management, Firewall												8 Hrs.		

Unit 4: Data Compression Introduction: Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification. Methods of Data Compression: Data compression-- Loss less & Lossy.	8 Hrs
Unit 5: Entropy encoding Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term).	6 Hrs
Unit 6: Recent Updates Recent trends in encryption and data compression techniques.	6 Hrs
Text Books/References: 1. Cryptography and Network Security, Mohammad Amjad, John Wiley & Sons. 2. Cryptography & Network Security by Atul Kahate, TMH. 31 3. Information Theory and Coding, Muralidhar Kulkarni, K S Shivaprakasha, John Wiley & Sons. 4. Cryptography and Network Security by B. Forouzan, McGraw-Hill. 5. The Data Compression Book by Nelson, BPB.	

Minor Degree in Computer Vision

Title of the Course: Computer Graphics Course Code: UETMM0342											L	T	P	Credit
											2	-	-	2
Course Pre-Requisites: Data Structure. Geometry.														
Course Description: Study basic and core concepts in Computer Graphics.														
Course Objectives: The objective of this course is to provide an insight to Geometry of Computer Graphics														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to											Bloom's Cognitive		
												level	Descriptor	
CO1	Explain the basic concepts of interactive computer graphics.											2	Understand	
CO2	Illustrate the fundamental concepts of computer graphics using mathematical models and											3	Apply	
CO3	Analyze basic illumination models and polygon rendering methods.											4	Analyze	
CO4	Build Animation sequences.											6	Create	
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11		PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-		-	1
CO2	2	3	2	3	1	-	-	-	-	-	-		1	1
CO3	3	3	2	3	1	-	-	-	-	-	-		2	2
CO4	2	3	2	3	1	-	-	-	-	-	-		2	3
Assessments :														
Teacher Assessment:														
		Sr. No.		Assessment					Remark					
		1		End Semester Examination					100 Marks					
Course Contents:														
Unit 1: Introduction to Computer Graphics Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Input and Output Device													5 Hrs.	
Unit 2: Transformations Basic 2D & 3D transformations - Translation, Scaling, Rotation, Refection, Shearing, MultipleTransformations, Translation and Homogeneous Coordinates, 2D –Rotation about arbitrary point, refection through an arbitrary line, 3D - Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space,Refection through an arbitrary plane, Windowing and View-porting, Sutherland - Cohen line clipping algorithm													5 Hrs.	
Unit 3: Raster Scan Graphics DDA,,Bresenhams Line drawing algorithm, Bresenhams Circle drawing algorithm, Scan Conversion techniques: RLE, Frame Buffer, Scan converting													5 Hrs.	

polygons: Edge fill and Seed fill algorithms, Anti-aliasing	
Unit 4: Curves and Surfaces Non-parametric and parametric curves, Representation of space curves, Cubic Spline, Bezier curves, Z- buffer algorithm, Warnock algorithm	5 Hrs
Unit 5: Illumination models and surface rendering methods Light sources, Basic illumination models, Displaying light intensities, Halftone patterns and Dithering Techniques, Polygon Rendering methods, Ray tracing methods	5 Hrs
Unit 6: Computer Animation Introduction, Key frame animation, Construction of an animation sequence, Motion control methods, Procedural animation, Key-frame animation vs. Procedural animation, Introduction to Morphing, Wrapping techniques, Three dimensional morphing.	5 Hrs
Text Books: 1. Computer Graphics C Version second edition –Donald D. Hearn, M. Pauline Baker (Pearson) 2. Mathematical elements for Computer Graphics - David F. Rogers, J. Alan Adams (MGH International) 3. Procedural elements for Computer Graphics - David F. Rogers (MGH International) Computer Graphics- Rajesh Maurya (WILEY India)	
Reference Books: 1. Principles of Computer Graphics Theory and Practice Using OpenGL and Maya, ShaliniGovil-Pai, (Springer) . 2. Computer Graphics (second Edition) - Zhigang Xiang & Roy Plastock (Schaum'sOutline Series, TMGH). 3. Computer Graphics Using OpenGL F.S. Hill Jr. Stephen M. Kelley, (Pearson Education).	

Title of the Course: Machine Learning											L	T	P	Credit
											3	-	-	3
Course Code: UETMM0442														
Course Pre-Requisites: Discrete Mathematics, Mathematics for Computer Science, Probability and Statistics.														
Course Description: This course provides an introduction to machine learning and covers the key concepts, algorithms, and techniques used in the field. Topics include supervised and unsupervised learning, linear and logistic regression, decision trees, clustering, and neural networks. Emphasis is placed on both theoretical understanding and practical applications.														
Course Objectives: The objective of this course is to provide an insight to Machine Learning														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to											Bloom's Cognitive		
												level	Descriptor	
CO1	Explain various concepts and terminology used in machine learning.											2	Understand	
CO2	Analyze the different types of machine learning models.											3	Apply	
CO3	Evaluate the performance of different machine learning algorithms.											4	Analyze	
CO4	Design custom machine learning algorithms to solve specific problems.											6	Create	
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	2							1			3	1	1	
CO2	2	1						1			3	1	1	
CO3		1						1			3	3	2	
CO4		2			3			1			3	3	1	
Assessments :														
Teacher Assessment:														
Sr. No.	Assessment							Remark						
1	End Semester Examination							100						
Course Contents:														
Unit 1: Introduction to Machine Learning Introduction to machine learning – definition, terminology. Types of machine learning – supervised learning, unsupervised learning, semi-supervised learning, reinforcement learning. Machine learning process. Performance metric in machine learning. Tools and frameworks. Data preprocessing (overview). Data visualization.													7 Hrs.	
Unit 2: Regression Simple linear regression – hypothesis, cost function, parameter learning with gradient descent, learning rate, gradient descent for linear regression, examples. Simple linear regression in matrix form. Multivariate linear regression – multiple features, hypothesis functions. Gradient descent for multiple variables, feature scaling, polynomial regression.													7 Hrs.	

Unit 3: Classification – Logistic Regression & Neural Network Logistic regression – definition, hypothesis representation, decision boundary, cost function, gradient descent for logistic regression. Multiclass classification. Regularization – overfitting & underfitting, cost function, regularized linear regression, regularized logistic Regression. Neural networks – neuron representation and model, hypothesis for neuron, cost function, solution of a problem using single neuron, gradient descent for a neuron. Multiclass classification with neural network. Learning in neural networks – feedforward neural network, backpropagation algorithm. Loss function – support vector machines (SVMs), softmax regression.	8Hrs.
Unit 4: Classification – Decision Trees and Naïve Bayes Decision trees – definition, terminology, the need, advantages, and limitations. Constructing and understanding decision trees. Common problems with decision trees. Decision tree algorithms – ID3, CART, random forest, examples. Naïve Bayes classifier. Instance-based classifier – K-Nearest Neighbour classifier.	7 Hrs
Unit 5: Unsupervised Learning and Reinforcement Learning Unsupervised learning: Introduction to clustering, K Means clustering, Hierarchical clustering, Association rule mining. Introduction to reinforcement learning – Q learning.	7 Hrs
Unit 6: Applications of Machine Learning Introduction to machine learning libraries, applications in structured data, applications in unstructured data – Image, Text, Speech.	7 Hrs
Text Books: 1. Machine Learning with Python - an approach to applied ML, by Abhishek Vijayvargia, BPB publications 2. Practical Machine Learning by Sunila Gollapudi Packt Publishing Ltd 3. Machine Learning by Tom M. Mitchell, McGraw Hill Education; First edition	
Reference Books: 1. Machine Learning for dummies John Paul Muller, Wiley Publication 2. Ethem Alpaydin - Introduction to Machine Learning, PHI 2nd Edition-2013 3. http://neuralnetworksanddeeplearning.com	

Emerging Minor in Sensor Technology

[illegible]

Course Contents:	
Unit1:--- Basics of Sensors Sensors and Transducers - Basics ,Introduction to Sensors, Materials for sensors, Multidisciplinary Aspects of Sensors ,Introduction to Sensor Parameters.	8 Hrs.
Unit2:--- Basics of Sensors Sensor Parameters-II, Sensor Parameters-III, Sensor Parameters-IV, Sensor Parameters-V, Numerical Examples.	6 Hrs.
Unit3:-- : Physics of Sensors Introduction: Physics of Sensors, Capacitive Sensor Architecture, Different Types of Capacitive Sensors ,Thermal Sensors Basics, Dynamic Condition of Thermal Sensors, Classification of Thermal Sensors, Chemical Sensor Basics, Electrochemical Sensors, Impedimetric Sensors.	8 Hrs.
Unit4:--- Physics of Sensors Physics of Optical Sensors, Physics of Magnetic Sensors, Physics of Acoustic Sensors, Physics of Micro fluidic Sensors , Various Sensor Geometries and Examples	6 Hrs.
Unit5:--- Sensor Fabrication and Characterization Techniques Micro fabrication Technologies , Deposition Techniques, Physical Vapor Deposition, Chemical Vapor Deposition , Patterning Techniques, Basics of Etching Techniques , Dry Etching Techniques , Optical and Electron Microscopy, Other Microscopy Techniques	6 Hrs.
Unit6:--- Basics of Sensor Systems and Circuits Sensor System: Basic Circuits, Amplifier Circuits, Instrumentation Amplifier, Filter Circuits, Sensor System: Experimental Demonstration	6 Hrs.

Textbooks: 1. Sensors and Transducers, I.R. Sinclair, Third Edition, Newnes Oxford, 2001. 2. Measurement Systems: Application & Design, E.A. Doebelin, McGraw Hill, 1990.
References: 1. Design of Analog CMOS Integrated Circuits, B. Razavi, McGraw-Hill Int. Edition, 2001. 2. A. Paul, M. Bhattacharjee, R. Dahiya, Solid-State Sensors, Wiley+IEEE, 2023.

Title of the Course: Micro-sensor circuits Course Code: UETMN0461		L	T	P	Credit								
		3	1	-	4								
Course Pre-Requisite: Basic Physics, Electronics and Mechanics													
Course Description Main objective of this course is to introduce students to micro- and nano-scale devices. After successfully completing this short course, students will have an idea about MEMS and NEMS devices and their applications. They will know how to design, analyze and characterize a micro or nano system. They will also have an idea about MEMS fabrication.													
Course Objectives: 7. Explain the Micro Sensor and MEMS. 8. Explain MEMS material and Micromating techniques. 9. Explain different MEMS sensors and its applications.													
Course Learning Outcomes:													
CO	After the completion of the course the student should be able to				Bloom_s Cognitive level	Descriptor							
CO1	Explain the basics Micro sensor and MEMS.				I	Define							
CO2	Analyze different MEMS materials and Micromatching techniques.				II	Analyzing							
CO3	Analyze different types of MEMS sensors.				II	Analyzing							
CO4	Explain different types of MEMS sensor applications.				VI	Design							
CO-PO Mapping:													
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1	1	1											
CO2	1			1							3		
CO3	1	2	1	1									3
CO4	1		3	1						1			3
Assessments:													
Teacher Assessment:													
Assessment							Marks						
ESE							100						
Course Contents:													
Unit1:--- Introduction to Micro sensors Introduction to Micro-sensors, Introduction to MEMS, Evaluation of MEMS and market survey,												8 Hrs.	

Applications of MEMS.	
Unit2 : MEMS Material MEMS material, MEMS material properties, Microelectronic technology for MEMS. Micromatching technology for MEMS.	8 Hrs.
Unit3:-- : Micromatching Process Etch stop techniques and microstructure, Surface and Quartz micromatching, Fabrication of micromachined microstructure.	6 Hrs.
Unit4:--- MEMS sensors-I MEMS Pressure and Flow sensor, Micromachined Flow sensor, MEMS Inertial sensors	6 Hrs.
Unit5:--- MEMS sensors-II Micromachined microaccelerometer for MEMS, MEMS Accelerometers for Avionics, Piezoresistive accelerometer technology, MEMS capacitive Accelerometer, MEMS Gyro sensor.	6 Hrs.
Unit6 :-- Applications of MEMS MEMS for Space application, Polymer MEMS and Carbon NanoTubes CNT, Wafer Bonding and packaging of MEMS, Interface Electronics for MEMS.	6Hrs.

Textbooks:

1. MEMS & Microsystems: Design and Manufacture by Ta-Ran Hsu, McGraw-Hill, Boston, 2002.
2. Introductory MEMS: Fabrication and Applications by Thomas M. Adams and Richard A. Layton, Springer, 2010.

References:

3. Introduction to Microsystems Technology: A Guide to Students by Gerald Gerlach and Wolfram Dotzel, Wiley, 2008.
4. Scaling Issues and Design of MEMS by Salvatore Baglio, Salvatore Castorina, and Nicolo Savalli, Wiley, 2007.

B.Tech. (Hons) in IOT.

Title of the Course: DBMS in Cloud Course Code:UETHN0351										L	T	P	Credit
										3	1	0	4
Course Pre-Requisite: Basic knowledge of Computer Programming													
Course Description: The course demonstrates the concept of cloud as a storage and make the student aware of its													
Course Objectives: 1. To understand fundamentals of cloud. 2. To study basics of database management. 3. To learn the use of SQL and Cloud Platforms. 4. To implement the cloud and SQL together for effective data management.													
Course Learning Outcomes:													
CO	After the completion of the course the student will be able to									Bloom’s Cognitive			
										Level		Descriptor	
CO1	Comprehend the significance of Cloud									II (Understanding)		Comprehend	
CO2	Recall the concepts of Database Management									I (Remembering)		Recall	
CO3	Implementing the concepts of SQL on Databases									III (Applying)		Implementing	
CO4	Associating the Cloud and Database Management concepts with SQL with actual									II (Understanding)		Associating	
CO-PO Mapping:													
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO2
CO1		2		2								1	
CO2		1										1	
CO3	2		2		2								2
CO4	2		2		2								2
Assessments:													
Assessment								Marks					
ESE								100					

Course Contents:	
Section- 1	
Unit 1: --- Database Management Introduction-History of database management systems - Basic concepts, Database Modeling, Relational model, Relational Database Management System, RDBMS Properties.	5 Hrs.
Unit 2: --- Introduction to SQL Introduction to SQL, Retrieving Data, Updating Data, Inserting Data, Deleting Data, Sorting and Filtering Data, Grouping Data, Using Subqueries, Joining Tables, Managing Tables.	7 Hrs.
Unit 3: ---Distributed Database Data Fragmentation, Replication, Structure of Distributed Database, trade-offs in Distributing the Database, Allocation Techniques for Distributed Database Design, Design of Distributed Databases	6 Hrs.
Section- 2	
Unit 4: --- Introduction to Cloud Cloud-The concept. Introduction to Private Clouds, Hybrid Clouds, Community cloud, Intercloud, Need for Privacy.	5 Hrs.
Unit 5: --- Cloud Architectures Cloud architectures: SaaS, PaaS, IaaS, SaaS & PaaS cloud computing providers- Amazon, Google and Microsoft, Cloud Storage, Cloud Services, Industrial Applications.	7 Hrs.
Unit 6: --- Cloud Data Management Infrastructure Security, Data security and storage, Identity and Access Management, Security Management in the Cloud, Privacy in Cloud,	6 Hrs.
Textbooks: 1. Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition 2. Principles of Distributed Database Systems M. Tamer Özsu, Patrick Valduriez Third Edition (Springer) 3. Architecting the Cloud - Design Decisions for Cloud Computing Service Models J. Jarvis Wiley	
References: 1. Fundamentals of Database Systems, Elmasri Navathe Pearson Education Seventh Edition 2. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition 3. Cloud Security and Privacy Tim Mather, Subra Kumaraswamy, and Shahed Latif O'Reilly Publication First Edition	

Unit wise Measurable students Learning Outcomes:

1. Student would be able to understand basics of database management
2. Student would be able to understand and apply SQL on databases
3. Student would be able to understand basics of Distributed Databases and design the same
4. Student would be able to understand cloud concepts
5. Student would be able to understand Cloud deployment
6. Student would be able to understand the various factors involved in cloud management

Title of the Course: Python for Cloud Computing Course Code: UETHN0451										L	T	P	Credit
										3	1	0	4
Course Pre-Requisite: Basic knowledge of Python Programming and Cloud Platforms													
Course Description: The course uses Python Programming for cloud services management													
Course Objectives: 1. To understand basics of cloud computing. 2. To learn fundamental and advanced Python Programming concepts. 3. To implement Python Language for cloud management. 4. To realize significance of security in cloud													
Course Learning Outcomes:													
CO	After the completion of the course the student will be able to									Bloom’s Cognitive			
										Level		Descriptor	
CO1	Comprehend the significance of Cloud Computing									II (Understanding)		Comprehend	
CO2	Recall the concepts of Python Programming									I (Remembering)		Recall	
CO3	Implementing the concepts of Python Programming for cloud management									III (Applying)		Implementing	
CO4	Associating the Cloud and Python concepts with real world problems									II (Understanding)		Associating	
CO-PO Mapping:													
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO2
CO1		2		2								1	
CO2		1										1	
CO3	2		2		2								2
CO4	2		2		2								2
Assessment								Marks					
ESE								100					

Course Contents:	
Section- 1	
Unit 1: --- Introduction to Cloud Computing Introduction: Cloud Computing, Characteristics of Cloud Computing, Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, Cloud Based Services and Applications: Case study	4 Hrs.
Unit 2: --- Python Basics Python Data Types and Data Structures: Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversion, Control Flow, Functions, Modules, Packages	6 Hrs.
Unit 3: ---Python for Cloud- I Python for Cloud Services: Virtual Machine Instance Service, Autoscaling Service, Scaling Storage Service, SQL Database Service	8 Hrs.
Section- 2	
Unit 4: ---Python for Cloud- II NoSQL Database Service, Message Queuing Service, Serverless Compute Service, Cloud Big Data Platform Service, Python for MapReduce, Python	8 Hrs.
Unit 5: --- Cloud Application Development in Python Design methodology for IaaS Service model, Design methodology for PaaS Service model, Case studies.	5 Hrs.
Unit 6: --- Cloud Security Introduction: Cloud Security, CSA Cloud Security Architecture, Authentication, Authorization, Key Management	5 Hrs.
Textbooks: 1. Cloud Computing- A Hands-on Approach Arshdeep Bahga, Vijay Madisetti 2. Python and AWS Mitch Garnat O'Reilly Publication 3. Architecting the Cloud - Design Decisions for Cloud Computing Service Models J. Jarvis Wiley	
References: 1. Python for AWS Adnaan Arbaaz Ahmed, Thariq Hussan M.I.,Lap Lambert Academic Publishing 2. Handbook of Cloud Computing Borko Furht, Armando Escalante Springer 3. Cloud Security and Privacy Tim Mather, Subra Kumaraswamy, and Shahed Latif	
Unit wise Measurable students Learning Outcomes: 1. Student would be able to understand basics of cloud computing 2. Student would be able to recall the basic concepts of Python Programming 3. Student would be able to implement Python for fundamental Cloud services 4. Student would be able to implement Python for more Cloud services 5. Student would be able to understand Cloud Application Development in Python	

Title of the Course: IOT Architecture and protocol Course Code: UETHN0551											L	T	P	Credit
											3	-	-	3
Course Pre-Requisites: Computer networks basics. Understanding of sensors and actuators. Study passive and active devices.														
Course Description: Internet of Things (IoT) is one of the upcoming technologies worldwide. IoT encompass different application domain like agriculture, space, healthcare, manufacturing, construction, water irrigation and mining. IOT hardware collect data upload data on cloud using different protocols. Cloud is making things possible for pervasive connectivity, storage, and computation, which, in turn, creates immense opportunities for building different IoT solutions														
Course Objectives:														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom’s Cognitive level		Descriptor	
CO1	Understand the concepts of Internet of Things										1		Understand	
CO2	Analyze basic protocols adapted in IOT network and transport layer										2		Analyze	
CO3	Analyze protocols adapted for IOT application layer										2		Analyze	
CO4	Evaluate Architecture and protocols used in given IoT applications										4		Evaluate	
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	2	3	-	-	-	2	-	-	-	-	2	2	1	
CO2	2	2	2	-	-	2	-	-	-	-	-	2	2	
CO3	3	3	3	2	-	2	2	2	-	-	-	3	2	
CO4	2	2	2	-	3	-	2	2	2	2	-	3	3	
Assessments :														
Teacher Assessment:														
.														
Assessment								Marks						
ESE								100						
Course Contents:														
Unit 1:- Overview of Internet of Things: IoT Conceptual Framework, IoT Architectural View, Characteristics of IoT, Comaprison of ISO/OSI; TCP/IP and IoT Protocol stack, IoT Communication models, IoT Device model, IoT levels and deployment, data enrichment, data consolidation and device management at IoT Gateway, Applications of IoT												4 Hrs.		
Unit 2:---Traditional internet physical and link layer protocols: Ethernet IEEE802.3, Wi-Fi IEEE802.11, Bluetooth and BLE, ZigBee												6 Hrs.		
Unit 3:- Network layer protocol: Internet connectivity, Internet-based communication, IPv4, ARP, RARP, IPv6, IP Addressing in the IoT,												7 Hrs.		
6LoWPAN protocol														
Unit 4:- Transport layer protocol: UDP TCP: TCP services, features, Segment, TCP connection, State transition diagram, flow control, error control, congestion control												6 Hrs.		
Unit 5:- Traditional internet Application layer protocol: HTTP, HTTPS, FTP, TELNET and ports. REST												6 Hrs.		

Unit 6:- IoT Application layer protocol: WINSOCKET, MQTT, CoAP, Data format; Media types for sensor markup language, JSON representation	7 Hrs.
Textbooks: 1. Internet of Things Architectures, Protocols and Standards, Simone Cirani, © 2019 JohnWiley & Sons Ltd 2. Internet of Things (A Hands-on-Approach) , Vijay Madiseti , Arshdeep Bahga 3. TCP/IP Protocol Suite, E/4 Paperback, Behrouz A. Forouzan, Mcgraw-hill Forouzan	
References: 1. Internet of Things : Architecture And Design Principles, Raj Kamal, McGraw Hill 2. Internet-of-Things (IoT) Systems, Architectures, Algorithms, Methodologies, Dimitrios Serpanos, Springer	
Unit wise Measurable students Learning Outcomes: 1. Discuss the basics concepts of IoT. 2. Examine Traditional internet protocol to be used in IOT implementation 3. Discuss internet protocol to be used in IOT implementation 4. Discuss Transport layer protocol to be used in IOT implementation 5. Discuss application layer protocol to be used in IOT implementation 6. Compare and contrast REST and MQTT protocol used in IOT implementation	

Title of the Course: IOT Device Design Course Code: UETHN0651											L	T	P	Credit
											3	1	-	4
Course Pre-Requisites: Computer networks basics. Basics of Microcontrollers and OS														
Course Description: This is a course on design and development of an IOT system. The IoT device have hardware design and software design aspect. The hardware design include selection of microcontroller to meet requirements and interfacing to Sensors, Actuators, Input and output devices using both serial or parallel buses. The software for IoT device includes RTOS based application programming. IoT is sub system of cloud. Installation of server on cloud and development of cloud side application with communication protocol like MQTT is essential														
Course Objectives:														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to											Bloom’s Cognitive level		Descriptor
CO1	Understand the concepts of Internet of Things											1	Understand	
CO2	Analyze basic protocols adapted in IOT network and transport layer											2	Analyze	
CO3	Analyze protocols adapted for IOT application layer											2	Analyze	
CO4	Evaluate Architecture and protocols used in given IoT applications											4	Evaluate	
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	2	3	-	-	-	2	-	-	-	-	2	2	1	
CO2	2	3	2	-	-	2	-	-	-	-	-	2	2	
CO3	3	3	3	2	-	2	2	2	-	-	-	3	2	
CO4	2	2	2	-	3	-	2	2	2	2	-	3	3	
Assessments :														
Teacher Assessment:														
Assessment								Marks						
ESE								100						
Course Contents:														
Unit 1:- IoT Device design resources: Factors affecting choice of microcontroller survey of 8/16 /32 bit microcontroller technologies and leading microcontroller for design of IoT												7 Hrs.		
Unit 2:- IoT Device interfacing to sensors and actuators: Interpretation of important specification of ADC-DAC, antialiasing filter for ADC , DAC , Consideration for selecting Vref for ADC-DAC, Automotive sensors, MEMS sensor, Digital sensors, Motors, relays, Contactors, Solenoid valves.												6 Hrs.		
Unit 3:- IoT device wireless communication interfacing: SPI and I2C buses, Interfacing of Bluetooth, WiFi and LoRa WAN Modules, Ethernet TCP-IP ready chips to microcontrollers,												6 Hrs.		
Unit 4:- IoT device user interface programming: Interfacing seven segment,												7 Hrs.		
LED static-dynamic, Keyboard and rotary encoder, Study and interfacing of alpha numeric and graphics LCD, libraries for LCD interfacing. Resistive and capacitive touch interfaces.														
Unit 5:- Introduction to RTOS Architecture of kernel, task and task scheduler, ISR, Semaphores, Mutex, Mailboxes and Pipes, Message Queues, Timers, Memory Management												4 Hrs.		

Unit 6:- Cloud ready RTOS application development: Library for IoT Programming, cloud server configuration, web server installation, MQTT broker installation, communication with cloud using MQTT protocol, securing IoT connection with cloud	6 Hrs.
Textbooks: 4. System-on-Chip Design with Arm® Cortex®-M Processors, JOSEPH YIU 5. The Designer's Guide to the Cortex-M Processor Family Second Edition Trevor Martin 6. ESP32 Series Datasheet 7. W5500 Datasheet 8. Understanding Automotive Electronics William B. Ribbens 9. Embedded/Real Time Systems Concepts, Design and Programming Black Book, Prasad, KVK 10. Azure RTOS ThreadX User Guide Published: February 2020 11. FreeRTOS User Guide 12. The Definitive Guide to Django: Web Development Done Right Adrian Holovaty, Jacob K. Moss	
References: 3. Internet of Things : Architecture And Design Principles, Raj Kamal, McGraw Hill 4. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga	
Unit wise Measurable students Learning Outcomes: 1. Survey of microcontroller technologies for IoT applications. 2. Design interface of sensors and actuators for IOT implementation 3. Design TCP IP based cloud connectivity using wired and wireless protocol used in IOT implementation 4. Design Input and Output system interface 5. Discuss RTOS basics 6. Implement MQTT broker, cloud server installation and RTOS application development	

Title of the Course: Data Analytics and Security of IOT Course Code: UETHN0751											L	T	P	Credit
											3	-	-	3
Course Pre-Requisites: Probability theory. Computer networks basics. TCP IP protocol.														
Course Description: Internet of Things (IoT) is one of the essential parts of modern manufacturing and social life. Normally IoT applications generate huge time series data. Secure transport of data is very much important for IoT applications industry. Analysis of data to produce meaningful information for decision making on the situation is essential. This course introduces students to the principles of Data analytics and Secure data transfer with case studies on IoT applications														
Course Objectives: 1. Introduce principles of data analytics. 2. To provide strong foundation for data analytics applications development 3. To explore different types of Data analytics 4. Security issues and mitigation of security attacks on IoT system														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom's Cognitive level		Descriptor	
CO1	Explore the fundamental concepts of data analytics										2	Understand		
CO2	Understand data analysis techniques for applications handling large data										3	Analyze		
CO3	Analyze the data and visualization										4	design		
CO4	Specify different types of IoT Attack methods										6	analyze		
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	
CO1	3													
CO2		3										2		
CO3		3				3							2	
CO4			3				2							
Assessments :														
Teacher Assessment:														
Assessment							Marks							
ESE							100							
ESE: Assessment is based on 100% course content with equal weightage for all units of the course.														
Course Contents:														
Unit 1:-: Introduction to Data Analytics: Basic Nomenclature Analytics Process Model Analytical Model Requirements, Data Analytics Types.												6 Hrs.		
Unit 2:--- Data Collection, Sampling, and Preprocessing:Standardizing Data, Categorization, Weights of Evidence Coding, Variable Selection Segmentation												8 Hrs.		
Unit 3:- Predictive Analytics: Target Defi nition, Linear Regression, Logistic Regression, Decision Trees, Neural Networks,Support Vector Machines, Ensemble Methods, Multiclass Classifi cation Techniques, Evaluating Predictive Models												6 Hrs.		
Unit 4:- Descriptive Analytics: Association Rules, Sequence Rules, Segmentation												6 Hrs.		
Unit 5:- Survival and Social network Analysis: Survival Analysis Measurements, Kaplan Meier Analysis, Parametric Survival Analysis , Social Network Defi nitions, Social Network Metrics, Social Network Learning, Relational Neighbor Classifier												8 Hrs.		
Unit 6:-. IoT Security: Introduction to IoT privacy and security.												8 Hrs.		

Vulnerabilities, security requirements and threat analysis, IoT Security Tomography and layered attacker model	
Textbooks: 1. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley. 2. Data Analytics Made Accessible by Dr. Anil Maheshwari 3. Internet of Things : Architecture And Design Principles, Raj Kamal, McGraw Hill 2017	
References: 1. 1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, Manning Publications Co., 1st edition, 2016. 2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 1st edition, 2013. 3. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2nd edition, 2014.	
Unit wise Measurable students Learning Outcomes: 1. Discuss the basics concepts of Data Analysis 2. Discuss the methods of data collection 3. Discuss the methods of Predictive Analytics 4. Discuss the methods of Descriptive Analytics 5. Discuss the methods of Survival and Social network Analysis 6. Discuss the methods of IoT Security	

Exit Courses

Title of the Course: Consumer Electronics	L	T	P	Credit
Course Code: UETEX0291	4	-	-	4

Course Pre-Requisite: Basic knowledge of Electronic Devices

Course Description: In developing nations demand of consumer electronic appliances is increasing day by day. This requires large number of technically trained men power in relevant industries. Looking towards the need of the country, in-depth knowledge for maintaining various electronics audio-video systems and home appliances is necessary for diploma engineering students. This subject will introduce the students with working principles, block diagram and advance features of consumer electronics appliances like audio-video systems, microwave oven. Knowledge so gained would also help in working in production units of these consumer gadgets. Students may also start their own repair workshops and may engage in fruitful self employment.

Course Objectives:

10. Troubleshoot different types of microphones.
11. Troubleshoot audio systems
12. Test working of various colour TV
13. Troubleshoot colour TV receivers.
14. Maintain various electronic home appliances.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Troubleshoot different types of electronics gadgets	I	Define
CO2	Test working of various colour TV	I	Define
CO3	Maintain various electronic home appliances.	II	Analyzing

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	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
ESE	50

ESE: Assessment is based on 100% course content.

Course Contents:

Unit1:-- Basic Electronic Devices

1.1 Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity and linearity, Reverberation 1.2 Audio level metering, decibel level in acoustic measurement 1.3 Microphone: working principle, sensitivity, nature of response, directional characteristics, 1.4 Types: carbon, condenser, crystal, electrets, tie-clip, wireless 1.5 Loud speaker: working principle, characteristic impedance, watt capacity, 1.6 Types: electrostatic, dynamic, permanent magnet etc, woofers and tweeters 1.7 Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard.

6 Hrs.

Unit2:--- Audio System 2.1 Audio system: CD player, home theatre sound system, surround sound 2.2 Digital console: block diagram, working principle, applications 2.3 FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T 2.4 PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification	6 Hrs.
Unit3:-- Monochrome TV 3.1 Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution 3.2 Composite video signal: horizontal and vertical sync details, scanning sequence 3.3 Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance 3.4 Different types of TV camera 3.5 Transmission standards: PAL system, channel bandwidth	6 Hrs.
Unit4:--- Color TV 4.1 PAL-D colour TV receiver, block diagram, Precision IN Line color picture tube. 4.2 Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver. 4.3 Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface) , Digital Video Interface 4.4 CD and DVD player: working principles, interfaces	8 Hrs.
Unit5:---FAX & Potocopier 5.1 FAX and Photocopier 5.2 Microwave Oven: types, single chip controllers, wiring and safety instructions, technical specifications 5.3 Washing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic 5.4 Air conditioner and Refrigerators: Components features, applications, and technical specification, 5.5 Digital camera and cam coder: - pick up devices - picture processing - picture storage	4 Hrs.

Textbooks:

1. Bali S.P. || Consumer Electronics —Pearson Education India, 2010 , latest edition
2. Bali R and Bali S.P. —Audio video systems : principle practices & troubleshooting|| Khanna Book Publishing Co. (P) Ltd., 2010 Delhi , India, latest edition
3. Gulati R.R. || 3Modern Television practices|| New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition

References:

1. Whitaker Jerry & Benson Blair —Standard handbook of Audio engineering|| McGraw-Hill Professional, 2010 , latest edition

Title of the Course: Radio Engineering Course Code: UETEX0292										L	T	P	Credit
										4	-	-	4
Course Pre-Requisite: Basic concepts of mathematics, Semiconductor devices and physics													
Course Description: This course will introduce basic communication system, basic concepts of analog modulation (AM, FM, and phase modulation), different types of receivers and its mathematical representation. Basic concepts and terminology of Wave Propagation, antenna and noise are addressed.													
Course Objectives: 1. To understand the principle and working of amplitude, frequency modulation and demodulation 2. To understand working of AM and FM receiver. 3. To understand principle and working of modulation and demodulation of PAM, PWM, PPM, PCM system. 4. To Understand the different types of noise, antenna and fundamentals of Wave Propagation													
CO		After the completion of the course the student should be able to								Bloom's Cognitive			
										level		Descriptor	
CO1		Illustrate different concepts related to radio communication.								II		Understanding	
CO2		Apply analytical methods to solve numericals on Amplitude, frequency modulation and total power of transmitter.								III		Applying	
CO3		Test the performance of radio receivers in terms of their characteristics.								VI		Creating	
CO4		Classify various types of antennas. Depending upon radiation patterns and applications								IV		Understanding	
CO-PO Mapping:													
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	1												
CO2		2											
CO3					2								2
CO4	1												
CO5					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 with 60-70% Weight age for course content (normally last three modules) covered after MSE.													
Assessment										Marks			
ESE										50			

Course Contents:	
Unit 1:--- Radio Waves Concepts: Radio waves, Phase, Amplitude, Wavelength and Frequency, Spectrum, Simple Radio Modulation and Tuning, Legal Aspects: Spectrum Management, ITU Regions, Radio Performance Concepts, Sensitivity, Signal-to-Noise Ratio (SNR)	07Hrs.
Unit 1:--- UNIT-I: Modulation in radio communication: Block diagram of communication system, base band signals, RF bands, Necessity of modulation, Amplitude Modulation principle, AM envelope, Modulation index, % modulation (Numerical expected), Trapezoidal patterns, AM transmitters: Block diagram of low level DSBFC, High level DSBFC, SSB, Vestigial sideband(VSB) in television system.	
Unit 2:--- AM Radio Receiver: Simplified block diagram of AM receiver, receiver parameters: Selectivity, BW, Dynamic range, Tracking, fidelity, Types of AM receiver: TRF and superhetrodyne (block diagram), AM detection types: using diode, practical diode detector, distortion in diode detector. Negative peak clipping & diagonal Clipping.	08 Hrs.
Unit 3:--- FM Radio Receiver: Block diagram of Double conversion FM receivers, FM demodulator, tuned circuit frequency discriminators, slope detectors, foster seeley discriminator, ratio detectors, PLL-FM demodulators, FM noise suppression, Pre emphasis and De emphasis in FM, Comparison of different modulation schemes.	08Hrs.
Unit 5:--- Noise in radio communication: Noise types (Internal noise, external noise), Sources of Noise, Shot Noise, Resistor, Noise figure, noise temperature, , Calculation of Noise in Linear Systems.	05 Hrs.
Unit 6:--- Antenna and Wave Propagation Introduction to radio wave propagation, ground wave, space wave and sky wave. Antenna: basic consideration of radiation mechanism, Antenna Parameters: Antenna gain, captured power density, Antenna captured area & power, Antenna polarization, beam width , BW, input impedance, Types of Antennas – Elementary doublet, Half wave dipole, folded dipole, yaggi-uda antenna .	08 Hrs.
Textbooks: 1 George Kennedy Electronics Communication System_ - IVth Edition-Tata McGraw Hill Publication. 2. Wayne Tomasi Electronics Communication System_ -Fundamentals through Advanced.- Vth Edition- Pearson Education. 3. Louis E. Frenzel, Principles of Electronics Communication Systems_ 3rd edition- Tata McGraw Hill Publication.	
References: 1. Dennis Roddy, John Coolen. Electronics Communications ,IV Edition-Pearson Education 2. V. Chandra Sekar, Analog Communication_, Oxford university. 3. R P Singh, S D Sapre Communication System-Analog & Digital II Edition –Tata McGraw Hill Publication	

4. B. P. Lathi, Zhi Ding, Modern Digital and Analog Communication Systems_ 4th edition,
Oxford university.

Title of the Course: Electronics Servicing and Maintenance of photo copy machine Course Code: UETEX0293											L	T	P	Credit
											4	0	0	4
Course Pre-Requisites: Electronics Components & Devices, Electronics Measurement & Instrumentation.														
Course Description: The individual on the job needs to know and understand Electronic and Electrical Components Resistors, Capacitors and Inductors, their identification, Protection equipment (anti-static wrist bands, shoes, dress, packaging, and other appropriate insulations) that are required to be used, First aid requirements in case of electrical shocks, cuts and other common injuries Soldering and De-Soldering Techniques, use of Photocopier Dismantling and assembling of paper feed mechanism, paper tray, Thermal unit and Toner Unit.														
Course Objectives:														
1) Identify the various sensors used in the copier and their fixtures.														
2) Paper trays, Paper feed mechanism and the sensors used for paper movement Periodic cleaning and servicing of copier machines , Printers.														
3) Identify different Parts of Printer Cartridges, toner, drum, their use and its replacement Overall fault finding and repair Printer following Standard fault -finding (troubleshooting) techniques, component testing methods.														
4) Troubleshooting through circuit diagram. Removal and Replacement of faulty Component.														
Course Learning Outcomes:														
CO	After the completion of the course the student should be able to										Bloom"s Cognitive			
											level	Descriptor		
CO1	Use and testing of Electrical & Electronic components.										2	Understand		
CO2	Use of Soldering/ de - soldering gun and other Tools and equipment for testing and making connections.										2	Understand		
CO3	Demonstrate the operation and maintain Photocopiers & Printers										3	Apply		
CO4	Explain & apply precautions, safety hazards and security procedures during work.										3	Apply		
CO-PO Mapping:														
CO	1	2	3	4	5	6	7	8	9	10	11		PSO1	PSO2
CO1	1	2				3					1			1
CO2	1	2				3					1			1
CO3	1	2				3					1			2
CO4	1	2				3					1			1
Assessments :														
Teacher Assessment:														
Assessment										Marks				
ESE										50				

Course Contents:	
Unit 1: Testing of Electrical & Electronic components Identify Electrical Component like Resistor, Capacitor, Inductor, Transformer etc. Making connection using components for the given circuit. Measurement of various parameters, like Voltage, Current etc. Identify Semiconducting Devices: Diodes, Transistors, common ICs like 741, 555 and ICs for basic gates. Use of fuse and its rating.	8 Hrs.
Unit 2: Soldering/ de- soldering techniques, Tools and equipment. Use of Soldering Iron, Soldering wire, Soldering Flux, Soldering method, Zero defect soldering, Desoldering pump, Temperature controlled soldering station, Hands - on - practices of Soldering. Use of Tools like Screw Driver Set Tweezers, Different Types of Tweezers, Nose Pliers, Wire Cutter Hot air gun Liquid solder pest, Magnifying Lamp and Measuring Tools Brush, Nipper Test and Measurement Equipment, Multimeter etc.	8 Hrs.
Unit 3: Operate and Maintain Photocopiers Use of control panel of Photocopier. Dismantling and assembling of paper feed mechanism, Fault finding and repairing in electrostatic high voltage unit. Maintenance of machine like Periodic cleaning and servicing of copier machines . Fault finding and repair a photo copier machine.	12 Hrs.
Unit 4: Use & Maintain Printers. Use, working and handling of Printers. Use of Laser Printers. Identify different Parts of Printer like Cartridges, toner, drum and their use. Replacement of Cartridges, toner etc. Fault finding and repair of Printers.	8 Hrs
Unit 5: Precautions, safety hazards and security procedures during work. Reporting incidents, system failures, power failures etc. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures. Protection equipment First aid requirement in case of electrical shocks and other injuries	8 Hrs
Text Books: 1. A Guide to Electronic Maintenance and Repairs by <u>A M Yusufu and Yunusa Ali S</u> 2. Photocopier Maintenance and Repair Made Easy Paperback – Import, 1 October 1993 by <u>Eric Kuaimoku</u>	
Reference Books: 1. Troubleshooting Electronic Equipment: Includes Repair And Maintenance, Second Edition by Dr R.S. Khandpur	

Unit1:--Electronic Materials : 1.1 Factors affecting the resistivity of material like temperature, area of cross-section, length (or distance) of the element. 1.2 Semiconductor materials: Intrinsic, extrinsic, charge carriers, P type and N Type, applications 1.3 Photo emissive materials: Properties, applications 1.4 Dielectric Materials: Types, Properties, Effect of frequency on performance of dielectric materials 1.5 Magnetic Materials: Properties, classification: Permanent magnetic dipole, diamagnetism, paramagnetism, ferromagnetism. 1.6 Soldering materials: Alloys and fluxes.	6 Hrs.
Unit2:--- Electronic Components 2.1 Passive Components: Concepts of Resistance, Capacitance , Inductance . Specifications, type and applications Voltage Dependent Resistor(VDR), Temperature Dependent Resistor(TDR), Light Dependent Resistor(LDR). 2.2 Electronic Materials and doping level for PN junction diode, Zener diode, LEDs, PNP and NPN transistor 2.3 Construction, working principle and applications of OLED 2.4 Integrated Circuit: Introduction to Monolithic IC, thick & thin film IC, Hybrid IC, Linear IC, Digital IC and IC packages (SIP, TO5, Flat, DIP), Pin , Device Identification, Temperature ranges. 2.5 Types and applications of micro electronic components: Micro motors, Micro relay, Micro switches	6 Hrs.
Unit3:-- Surface Mount Devices 3.1 Introduction to Surface Mount Technology(SMT) and Surface mount Devices (SMD). 3.2 Assembly and rework techniques: Contact and noncontact types of soldering and de-soldering 3.3 Advantages and Disadvantages of SMT 3.4 SMD packages : Two terminal package for passive and active components, Three or four terminal packages, five or six terminal packages, More than six terminal packages; Examples of each 3.5 Automatic component insertion technique	6 Hrs.
Unit4:--- Printed Circuit Board 4.1 Introduction to PCB, Advantages, disadvantages of PCB, Types of PCB and applications 4.2 Constructional features of PCB 4.3 Flexible PCB, Multilayer PCB, plated through hole (PTH) 4.4 Screen printing, photo-printing methods 4.5 Soldering Techniques: Dip, wave.reflow 4.6 PCB testing 4.7 Need of Electronic waste management , E-Waste Recycling,	8 Hrs.
Unit5:--- Solar system components 5.1 Photovoltaic materials ,properties and applications 5.2 Solar Cell: Working Principle and Construction 5.3 Materials used in a Solar Panel 5.4 Energy storage system used in solar panel, its ratings and selection factors	4 Hrs.

5.5 Terminologies used in energy storage system like capacity, power ratings, depth of discharge (DoD), round-trip efficiency, warranty and life span	
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Textbooks:

4. Walter ,Bosshart —Printed Circuit Boards|| Tata McGraw Hill ISBN-13 978- 0074515495
5. Madhuri Joshi —Electronic Components and Materials|| Shroff Publishers & Distributors private ltd. ISBN-13: 978- 8173669002

References:

2. Dhir S M —Electronic Components and Materials|| Tata McGraw Hill ISBN: 9780074630822
3. Grover & Jamwal —Electronic Components and Materials || Dhanpat Rai & Sons, ISBN-13 5551234023845