Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Curriculum and Structure

for

Electronics Engineering
(Under Graduate Programme)
From
Academic Year 2019-2020

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation scheme for

Second Year B.Tech. Program in Electronics Engineering Semester-III

Course Code	Curriculum component	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Marks		
								Max	Min	
UELN0301	BS	Engineering Maths-III	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0302	PC	Electronic Devices and Circuits	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0303	PC	Digital Design using HDL	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0304	PC	Network Analysis	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0305	PC	Electronic Measurement and Instrumentation	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0361	Audit-I	Environmental Studies	2	-	-	-	-	100	40	40
UELN0331	PC	Electronic Devices and Circuits LAB	-	-	2	1	ISE	50	20	
							ESE (POE)	50	20	
UELN0332	PC	Electronic Measurement and Instrumentation LAB	-	-	2	1	ISE	50	20	
UELN0333	PC	Digital Design using HDL LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0334	PC	Computer Aided Design LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0351	PRJ	Micro project- I LAB	-	-	2	1	ISE	50	20	
Total			15+2	2	10	22	-	900 (+100 Audit)	360(+40 Audit)	

Total Credits: 22

Total Contact Hours/Week: 29Hrs

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation scheme for

Second Year B.Tech. Program in Electronics Engineering Semester-IV

Course Code	Curriculum compone	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Marks		
								Max	Min	
UELN0401	PC	Linear Integrated Circuits	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0402	PC	Analog Circuit Design	4	-	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0403	PC	Control System Engineering	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0404	PC	Analog Communication	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0405	PC	Signals & Systems	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0461	Audit -II	Content Creation using Information and web Technologies	2	-	-	-	ESE	100	40	40
UELN0431	PC	Linear Integrated Circuits LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0432	PC	Analog Circuit Design LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0433	PC	Analog Communication LAB	-	-	2	1	ISE	50	20	
							ESE (POE)	50	20	
UELN0434	PC	Control System Engineering LAB	-	-	2	1	ISE	50	20	
UELN0451	PRJ	Micro project-II LAB	-	-	2	1	ISE	50	20	
Total			16+2	1	10	22	-	900 (+100 Audit)	360 (+40 Audit)	

Total Credits: 22

Total Contact Hours/Week: 29 Hrs

Note:

- **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **ISE:** In Semester Evaluation.
- **HS:** Humanities, Social science and Management, **BS: Basic sciences including mathematics**
- **ES:** Engineering Science,**PC:** Professional Core,**PE:** Professional Elective
- **OEL:** Open elective, **PRJ**: Project work, Seminar, Internship in industry etc.
- ** :Course code for Open Elective
- XX : Course code for Professional Elective
- $$: Course code for Audit Course

List of Audit Courses

Year	Course Code	Audit Course	Audit Course
Second Year B.Tech-I	UELN0361	Audit Course-I	Environmental Studies
Second Year B.Tech-II	UELN0461	Audit Course-II	Content Creation using Information and web Technologies

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation scheme for

Third Year B.Tech. Program in Electronics Engineering Semester-V

Course Code	Curriculum	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Weightage		
								Max	Min	
UELN0501	PC	Electromagnetic Engineering	3	1	-	4	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0502	PC	Digital Communication	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0503	PC	Power Electronics	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0504	PC	Microcontrollers	4	-	-	4	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN05XX	PE	Professional Elective-I	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0561	Audit-III	Industry 4.0	2	-	-	-	ESE	100	40	40
UELN0531	PC	Digital Communication LAB	-	-	2	1	ISE	50	20	
							ESE(OE)	50	20	
UELN0532	PC	Power Electronics LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0533	PC	Microcontroller LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN05XX	PE	Professional Elective-I LAB	-	-	2	1	ISE	50	20	
UELN0551	PRJ	Micro project-III LAB	-	-	2	1	ISE	50	20	
Total			16+2	1	10	22	-	900 (+100 Audit)	360 (+40 Audit)	

Total Credits: 22

Total Contact Hours/Week: 29Hrs

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation scheme for

Third Year B.Tech. Program in Electronics Engineering Semester-VI
(Third Year B.Tech-II)

Course Code	Curriculum component	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Weightage		
								Ma	Min	
UELN0601	PC	Computer Architecture and Operating System	4	-	-	4	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0602	PC	Digital Signal Processing	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0603	PC	Data Structures and Algorithms	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UOEL06**	OE	Open Elective-I	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN06XX	PE	Professional Elective-II	3	-	-	3	ISE-I	10	-	40
							MSE	30		
							ISE – II	10		
							ESE	50	20	
UELN0661	Audit-IV	Aptitude Enhancement with Vedic Maths	2	-	-	-	ESE	100	40	40
UELN0641	PRJ	Mini Project	-	-	2	1	ISE	25	10	
							ESE(OE)	50	20	
UELN0631	PC	Computer Architecture and Operating System LAB	-	-	2	1	ISE	50	20	
UELN0632	PC	Model Based Design LAB	-	-	4	2	ISE	25	10	
							ESE (OE)	50	20	
UELN0633	PC	Data Structures and Algorithms LAB	-	-	2	1	ISE	50	20	
							ESE (POE)	50	20	
UELN0634	PC	Digital Signal Processing LAB	-	-	2	1	ISE	50	20	
							ESE (POE)	50	20	
Total			16+2	-	12	22	-	900 (+100 Audit)	360 (+40 Audit)	

Total Credits: 22

Total Contact Hours/Week: 29 Hrs

Note:

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- **HS:** Humanities, Social science and Management, **BS: Basic sciences including mathematics**
- **ES:** Engineering Science,**PC:** Professional Core,**PE:** Professional Elective
- **OEL:** Open elective, **PRJ**: Project work, Seminar, Internship in industry etc.
- ** :Course code for Open Elective
- XX : Course code for Professional Elective
- $$: Course code for Audit Course

List of Professional Electives

Year	Professional Elective	Course Code	Communication Stream	Course Code	Embedded VLSI Stream	Course Code	Systems and Technologies Stream
Third Year B.Tech -I	Professional Elective-I	UELN0521	Wireless Communication Networks	UELN0522	CMOS VLSI Design	UELN0523	Automotive Electronics
Third Year B.Tech -II	Professional Elective-II	UELN0621	Digital Image Processing	UELN0622	Embedded System Programming	UELN0623	Bio-Medical Electronics

List of Professional Electives LAB

Year	Professional Elective	Course Code	Communication Stream	Course Code	Embedded VLSI Stream	Course Code	Systems and Technologies Stream
Third Year B.Tech-I	Professional Elective-I	UELN0534	Wireless Communication Networks	UELN0535	CMOS VLSI Design	UELN0536	Automotive Electronics

List of Audit Courses

Year	Course Code	Audit Course	Audit Course
Third Year B.Tech-I	UELN0561	Audit Course-III	Industry 4.0
Third Year B.Tech-II	UELN0661	Audit Course-IV	Aptitude Enhancement with Vedic Maths

List of Open Electives

Year	Course Code	Open Elective-I
Third Year B.Tech-II	UOEL0625	Microcontroller Architectures and Programming
	UOEL0626	Industrial Automation

Kolhapur Institute of Technology's
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Teaching and Evaluation scheme for

Final Year B.Tech. Program in Electronics Engineering Semester-VII
(Final Year B.Tech-I)

Course Code	Curriculum component	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Weightage		
								Max	Min	
UELN0701	PC	Embedded System Design	4	-	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0702	PC	Computer Networks	4	-	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UOEL07**	OE	Open Elective-II	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN07XX	PE	Professional Elective-III	3		-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0703	ES	Scripting Languages	1	-	-	1	ISE	50	20	20
UELN0761	Audit-V	Smart Manufacturing	2	-	-	-	ESE	100	40	40
UELN0731	PC	Embedded System Design LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0732	ES	Scripting Languages LAB	-	-	2	1	ISE	50	20	
UELN0733	PC	Computer Networks LAB	-	-	2	1	ISE	50	20	
							ESE(POE)	50	20	
UELN0751	PRJ	Project-I	-	-	4	2	ISE	50	20	
							ESE(OE)	50	20	
Total			15+2	0	10	20	-	800 (+100 Audit)	320(+40 Audit)	

Total Credits: 20

Total Contact Hours/Week: 27 Hrs

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation scheme for

Final Year B.Tech. Program in Electronics Engineering Semester-VIII
(Final Year B.Tech-II)

Course Code	Curriculum component	Course	Teaching scheme				Evaluation Scheme			
			L	T	P	Credits	Scheme	Weightage		Min
UELN08XX	PE	Professional Elective-IV	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN08XX	PE	Professional Elective -V	1	-	-	1	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UELN0861	Audit-VI	Audit Course-VI (Online Course)	2	-	-	-	-	100	40	40
UELN0851	PRJ/WI	Project-II and Winter Internship (WI)	-	-	12	6	ISE-I	50		80
							ISE-II	50	20	
							ESE (OE)	100	40	
UELN08XX	PE	Professional Elective -IV LAB	-	-	2	1	ISE	50	20	40
							ESE(POE)	50	20	
UELN08XX	PE	Professional Elective -V LAB	-	-	2	1	ISE	50	20	40
							ESE(OE)	50	20	
Total			4+2	0	16	12	-	600 (+100 Audit	240(+40 Audit)	

Total Credits: 12
Total Contact Hours/Week: 22 Hrs

Note:

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- **ES:** Engineering Science,**PC:** Professional Core,**PE:** Professional Elective
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- ** : Course code for Open Elective
- XX : Course code for Professional Elective
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List of Professional Electives

Year	Professional Elective	Course Code	Communication Stream	Course Code	Embedded VLSI Stream	Course Code	Systems and Technologies Stream
Final Year B.Tech-I	Professional Elective-III	UELN0721	Antennas and Wave Propagation	UELN0722	SOC Design and Testing	UELN0723	Soft Computing
Final Year B.Tech-II	Professional Elective-IV	UELN0821	Microwave Theory and Techniques	UELN0822	Mixed Signal Design	UELN0823	Modern Power Electronics
Final Year B.Tech-II	Professional Elective-V	UELN0824	Digital TV	UELN0825	IOT and Cloud Computing	UELN0826	PLC and SCADA

List of Professional Electives LAB

Year	Professional Elective	Course Code	Communication Stream	Course Code	Embedded VLSI Stream	Course Code	Systems and Technologies Stream
Final Year B.Tech-II	Professional Elective-IV	UELN0834	Microwave Theory and Techniques	UELN0835	Mixed Signal Design	UELN0836	Modern Power Electronics
Final Year B.Tech-II	Professional Elective-V	UELN0837	Digital TV	UELN0838	IOT and Cloud Computing	UELN0839	PLC and SCADA

List of Audit Courses

Year	Course Code	Audit Course	Audit Course
Final Year B.Tech-I	UELN0761	Audit Course-V	Smart Manufacturing
Final Year B.Tech-II	UELN0861	Audit Course-VI	Online

List of Open Electives

Year	Course Code	Open Elective-II
Final Year B.Tech-I	UOEL0725	Artificial Intelligence
	UOEL0726	Introduction to Control systems

Title of the Course: ENGINEERING MATHEMATICS-III	L	T	P	Credits
Course Code: UELN0301	3	1	---	4

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

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

Course Objectives:

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

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive level	Descriptor
CO1	Summarize fundamental propertiesof vector calculus and integral transforms of single variable continuous functions.	II	Understanding
CO2	Apply the knowledge of differential equation to get the solutions of electrical circuit problems.	III	Applying
CO3	Apply the knowledge of Laplace transforms to solve the problems arises in electronics engineering.	III	Applying
CO4	Make use of appropriate probability distribution for finding probabilities of events.	III	Applying
CO5	Develop Fourier series expansion of a function over the given interval.	III	Applying
CO6	Determine Fourier transforms and inverse Fourier transforms ofgiven function and use it to solve the related problems.	IV	Analyzing

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2										1		
CO2	3	2										1		
CO3	3	2										1		
CO4	3	2										1		
CO4	3	2										1		
CO5	3	2										1		
CO6	3	2										1		

Assessments :

Teacher Assessment:

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

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

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

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

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

Course Contents:

Unit 1: Linear Differential Equations with Constant Coefficients and Its Applications 1.1 Definition, general form, complete solution 1.2 Rules for finding complementary function 1.3 Short methods for finding particular integral 1.4 General rule for finding particular integral 1.5 Applications to electrical circuits	8 **Hrs.**
Unit 2: Vector Calculus 2.1 Differentiation of vectors 2.2 Velocity and acceleration 2.3 Gradient of scalar point function and directional derivative 2.4 Divergence of vector point function 2.5 Curl of a vector point function 2.6 Solenoidal and Irrotational vector fields	7 **Hrs.**
Unit 3: Laplace Transforms 3.1 Definition, transforms of elementary functions, properties of Laplace transform 3.2 Transforms of derivative and integral 3.3 Inverse Laplace transforms 3.4 Inverse Laplace transforms by using partial fractions and convolution theorem. 3.5 Transforms of periodic functions and Heaviside unit step function. 3.6 Solution of linear differential equations with constant coefficients by Laplace transform method.	8 **Hrs.**
Unit 4: Probability Distributions 4.1 Random variable 4.2 Probability mass function and probability density function 4.3 Binomial distribution 4.4 Poisson distribution 4.5 Normal distribution	6 **Hrs.**
Unit 5: Fourier Series& Fourier Transform 5.1 Definition, Euler's formulae, 5.2 Dirichlet's conditions, functions having points of discontinuity. 5.3 Change of interval 5.4 Expansion of odd and even periodic functions 5.5 Half range series	7 **Hrs.**

Unit 6: Fourier Transform 6.1 Fourier integral theorem 6.2 Fourier transforms 6.3 Fourier sine and cosine transforms 6.4 Finite Fourier sine and cosine transforms 6.5 Properties of Fourier transforms 6.6 Convolution theorem for Fourier transform 6.7 Parseval's identity for Fourier transform	6 **Hrs.**

Recommended Books:

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.
2. A Text Book of Applied Mathematics, Vol. I, Vol. II and vol. III by P. N. Wartikar & J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune.

Reference Books:

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

Unit wise Measurable Learning Outcomes:

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

Students will be able to

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

Unit 2: Vector Calculus

Students will be able to

a) Differentiate vector quantity.
b) Find the directional derivative of scalar point function.
c) Find the divergence and curl of vector point function.
d) Determine solenoidal and irrotational fields with the help of divergence and curl respectively.

Unit 3: Laplace Transforms

Students will be able to

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

Unit 4: Probability Distributions

Students will be able to

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

Unit 5 : Fourier Series

Students will be able to

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

Unit 6: Fourier Transforms

Students will be able to

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

Title of the Course:Electronics Devices and Circuits	L	T	P	Credit
Course Code:UELN0302	3	-	-	3

Course Pre-Requisite: Basic knowledge of mathematics, atomic physics.

Course Description:

This course encompasses the study ofSemiconductor devices and their principle of operation, electrical characteristics and analysis/design of basic application circuits.

Course Objectives:

1. To understand nature & scope of semiconductor electronics.
2. To describe physical model of basic components
3.To construct simple electronic circuits to accomplish specific function.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	Describe fundamentals of semiconductor physics.	II	Understanding
CO2	Explain working principle and characteristics of Diodes, transistors and their applications.	II	Understanding
CO3	Analyze transistor biasing circuits, various configurations of transistor	IV	Analyzing
CO4	Analyze various transistor amplifier circuits and their hybrid models over frequency range,.	IV	Analyzing

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2		"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"		"-"	"-"
CO2	3	1		"-"	"-"	"-"	"-"	"-"	"-"	"-"		1	"-"	"-"
CO3	2	3	3		"-"	"-"	"-"	"-"	"-"	"-"	"-"		"-"	1
CO4	2	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 with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:	
Unit 1INTRODUCTION TO SEMICONDUCTOR PHYSICS: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors	6 **Hrs.**
Unit 2DIODE AND CHARACTERISTICS Generation and recombination of carriers, I-V characteristics, Avalanche breakdown, Zener diode and its characteristics, Schottky diode, Point contact diode, LED, Photo diode.	6 **Hrs.**
Unit 3 DIODE APPLICATIONSAND FILTERS. P-N junction Diode applications-Rectifiers (Half wave, full wave: center tap and bridge type, parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc.), Filters: Need of Filters, Types of Filters: Capacitor, Inductor, LC and CLC filters, Analysis of above Filters for ripple factor & Regulation. Design of unregulated power supply using FWR with all types of filters Voltage multipliers, Clipper and Clamper circuits.	8 **Hrs.**
Unit 4:-BIPOLAR TRANSISTORS : NPN Transistor, PNP Transistor, IV characteristics, Charge storage and transient response, Load line concept, Current voltage characteristics, Transistor Configurations(CE,CB & CC configuration), Biasing (fixed bias, collector to base bias & voltage divider bias) and stability factor for all biasing circuits.	6 **Hrs.**
Unit 5:-BIPOLAR TRANSISTOR'S SMALL SIGNAL MODELS : H-Parameters, Hybrid model for transistor (CE,CB&CC configuration),analysis of amplifier for Voltage gain, Current Gain, Input Resistance and Output Resistance in terms of h-parameters**.**	8 **Hrs.**
Unit 6:-- BJT AMPLIFIERS Classification of amplifiers, frequency response of cascade amplifier, Feedback Amplifier: Classification of feedback amplifier(voltage Series ,Current series, voltage shunt, current shunt feedback amplifiers), Study of emitter Follower, Darlington amplifier with bootstrapping principle, Needof Cascading, Evaluation of Ri, Ro, Ai, Av, Types of coupling, RC coupled, Transformer coupled, Direct coupled amplifier, two stage ,RC coupled amplifier with and without feedback.	8 **Hrs.**

Textbooks:

1. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi scitech Publication.
2. Electronic Devices and Circuits by Mantri & Jain
3. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits Saunder's College Publishing, 1991.
5.

References:

1. Electronic Devices and Circuit Theory by Boylestad, Pearson Publication.
2. Electronic Devices and Circuits by J.B.Gupta,Katson Publication
3. Electronic Devices and Circuits by Millman, Halkias, TMHPublication.
4. Schaum's Outlines, " Electronic Devices and Circuits"
5. Electronic Devices and Circuits by Allen Mottershead-PHI.
6. Solid State Electronic Devices by Ben Streetman, PearsonPublication.

Unit wise Measurable students Learning Outcomes:

1The student will be able to explain basics of semiconductor physics.

2. The student will be able to analyze diode circuit using basic engineering sciences.

3The student will be able tomake use of semiconductor devices as per industry practice in a satisfactory manner.

4 The student will able to analyze transistor biasing circuits.

5 The student will be able to estimate h-parameters of CB, CC & CE transistor's configurations

6 The student will be able to analyze and design various applications of bipolar junction transistors such as feedback amplifiers

Title of the Course: Digital Design using HDL	**L**	**T**	**P**	**Credit**
Course Code: UELN0303	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Number system basics, Logic Gates, Boolean Algebra

Course Description:

This course covers the fundamentals of Digital Design, Boolean Logic Simplification and Combinational Logic Design,MSI devices,Sequential Logic Design,Logic Families and Semiconductor Memories design using HDL.

Course Objectives:

1. To explain the analytical methods for combinational and sequential logic design.
2. To discuss in detail the specifications of various LSI MSI logic families and CPLD, FPGA architectures.
3. To develop the methodology for digital design using VHDL.
4. To motivate students to use EDA tools for design and simulation.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's level	Bloom's Descriptor
CO1	Design combinational logic circuits	VI	Creating
CO2	Design synchronous sequential logic circuits	VI	Creating
CO3	Differentiate logic families, semiconductor memories and PLDs.	II	Comprehension
CO4	Design and simulate digital logic using HDL and EDA tools.	VI	Creating

CO-PO Mapping:

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

Assessments :

Teacher Assessment:

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

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

ISE 1 and ISE 2 are based on assignment/declared test/quiz 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:---	**5Hrs.**
Logic Simplification: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps, Binary codes, Code Conversion.	

Unit 2:--- Combinational logic design: Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display Barrel shifter , ALU, Comparators	**5Hrs.**
Unit 3:-- Sequential Logic Design: Latches, flip-flops: S-R, D, JK and Master-Slave JK FF, Edge triggered FF, Flip Flop conversion, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts.	**7Hrs.**
Unit 4:--- Logic Families: TTL NAND,CMOS gates, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate, study of TTL and CMOS families and their interfacing,	**5Hrs.**
Unit 5:---Semiconductor memories and programmable devices: Memory Terminologies, General Memory Operation, Read-Only Memories, Flash Memory, Semiconductor RAM , Dynamic RAM (DRAM), Memory elements, Concept and architecture of Programmable logic devices like CPLD and FPGA.	**5Hrs.**
Unit 6:--- Digital Design using VHDL:VLSI Design flow, Design entry(Schematic, FSM & HDL), different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation, VHDL constructs and codes for combinational and sequential circuits.	**5Hrs.**

Textbooks:

1. R. J. Tocci, N. S. Widmer, G. L. Moss "Digital Systems principles and Applications" Tenth Edition, Pearson.
2. M. Morris Mano, Michael D. Ciletti, "Digital Design" 5th edition, Pearson.
3. Donald P Leach, Albert Paul Malvino, Goutam Saha, "Digital Principles And Applications"8th Edition, Tata McGraw Hill.
1. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

References:

1. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
2. "An Engineering Approach to Digital Design" William I. Fletcher, Prentice-Hall India Publication

Unit wise Measurable students Learning Outcomes:

Unit 1: Student should be able to optimize the logic circuits.

Unit 2: Student should be able to design combinational logic circuits.

Unit 3: Student should be able to design sequential logic circuits.

Unit 4: Student should be able to design using logic families.

Unit 5: Student should be able to choose appropriate memory technologies and appropriate programmable devices for given application.

Unit 6: Student should be able to use EDA tools and describe the hardware design using VHDL.

Title of the Course: Network Analysis Course Code:UELN0304	L 3	T 1	P --	Credit 4

Course Pre-Requisite: Basic Electrical Engineering , Solution of Integral-Differential Equations, Laplace Transform

Course Description:

This Course aims to develop the basic concepts of network analysis, which is the pre-requisite for all the Electronics Engineering courses.

The course deals with understanding various network reduction techniques such as Sourcetransformation, Network theorems etc. and apply these techniques to simplify different complex R-L-C circuits. The course enables students to design resonant circuits which are used at different frequency spectrum. The course teaches students to understand two-port networks and synthesize different parameters using two-port networks. Students understand and implement types of passive filters .Students acquire knowledge about the Transient Response of complex R-L-C passive circuits and then they are able to design stable systems.

Course Objectives:

1. Solve different complex circuits using various network reduction techniques such as Source transformation, Network theorems etc.
2. To discriminate between series and parallel resonance and design Resonant circuits
3. To evaluate two port network parameters
4. To understand Time Domain system behaviour using pole zero plot
5. To understand and implement types of passive filters.
6. To Evaluate AC and DC transients Response for complex R-L-C series and parallel circuits and to analyze the system stability.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Cognitive level	Descriptor
CO1	**Analyze**the basic AC and DC circuits using Nodal ,mesh analysis and network theorems	IV Analysis	Cognitive
CO2	**Distinguish**between series resonance and parallel resonance concepts and perform parameter calculations for resonance frequency , half power frequencies, BW ,Q factor ,current ,voltages	IV Analysis V Complex Overt Response	Cognitive Psychomotor
CO3	**Derive**two port network parameters viz Z, Y, ABCD, h and their interrelationships and **determine** different network functions	V Synthesis	Cognitive
CO4	**Apply**Laplace Transform for steady state and transient analysis , appreciate the frequency domain techniques and **design** filters	III Application V Synthesis	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-	3	-
CO3	-	3	1	-	-	-	-	-	-	-	-	-	-	3
CO4	-	3	-	3	3	-	-	-	-	-	-	2	-	1

Assessments :

Teacher Assessment:

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

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

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
MSE: Assessment is based on 50% of course content (Normally first three 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:--- Network Fundamentals: Representation of voltage & current sources.(Independent & Dependent) , source transformation, series & parallel connection of passive elements(R,L,C), graph of network & its parts, loops & trees, linear graphs & incidence matrix, cut sets, planner & non-planner graph loop matrix. Star- Delta transformation, reduction of networks: Mesh analysis, Node analysis. Super mesh and super node analysis. Matrix approach of network containing voltage and current sources and reactances.	-7- **Hrs.**
Unit 2:---Network Theorems D.C. and A.C. network solution using dependent and independent sources: Superposition Theorem, Millman's Theorem, Norton's Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Duality theorem,Compensation and Tellegen's theorem	-7- **Hrs.**
Unit 3:--- Resonance: Definition, Types: series & parallel resonance. Series resonance- resonant frequency, variation of impedance, admittance, current & voltage across L & C with respect to frequency, Effect of resistance on frequency response, Selectivity, B.W. and Quality factor. Parallel resonance – Anti resonance frequency, variation of impedance & admittance with frequency, Selectivity& B.W.	-6- **Hrs.**

Unit 4:--- Two Port Network & Network Functions: Two port network: Open circuit impedance (Z) parameters, Short circuit admittance (Y) parameters, Hybrid (H) parameter,Transmission parameters(ABCD), Interrelation of different parameters, Interconnections of two port network (Series, Parallel, Cascaded, Series- Parallel) Network functions: Network functions for one port & two port networks, Driving point impedance and admittance of one port network, Driving point impedance, admittance & different transfer function of two port network(Z,Y,H & T parameters). Concept of complex frequency, significance of poles & zeros. Restrictions on poles & zeros for transfer &driving points function, pole zero diagram.	-8- **Hrs.**
Unit 5:---Filters &Attenuators: **Filters**: Definitions, classification & characteristics of different filters, filter fundamental such as attenuation constant, phase shift constant, propagation constant, characteristic impedance, relationship between decibel and neper. Design & analysis of constant K, M derived filters (low pass, high pass, band pass & band stop filters): T & Pi sections **Attenuators** -Definitions, classification, Analysis & design of T type, Π type , α Lattice , bridged- T & L types attenuators Equalizer: Inverse network, series and shunt equalizer	-6- **Hrs.**
Unit 6:--- Transient Response: Analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. Transient behaviour Steady state & transient response (Voltage & Current) DC response ofRL,RC,RLC circuits Sinusoidal response of RL, RC & RLC circuits	-6- **Hrs.**
Textbooks: 1 A. Sudhakar ,ShyammohanS.Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication (Unit II,IV,VI) 2 A.Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition (Unit I,II) Dhanpat Rai & co 3 D. Roy Choudhury 'Networks & Systems' - New Age International Publisher (Unit I,II,III) 4 Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai & Co. (Unit III,IV,V,VI) 3 JosephEdministrar 'Theory & Problems of Electronic Circuit (Schaum's series)' – Tata McGraw Hill, Publication	
References: 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 3Boylestad 'Introductory Circuit Analysis' – Universal book stall, New Delhi.(Unit I,II)	
Unit wise Measurable students Learning Outcomes: **Unit1** **UO 1.1:** Students will be able to apply Circuit analysis and Circuit reduction techniques **UO 1.2:** Students will be able to apply Graph Theory and form Incidence Matrix, Tie-Set Matrix, Cut –Set Matrix **UO 1.3:** Students will be able to apply Mesh and Nodal Analysis	

Unit 2

UO 2: Students will be able to apply Network Theorems to DC and AC circuits with R,L,C components

Unit 3

UO 3.1: Students will able to design R-L-C series resonant circuit for different frequencies and evaluate Q factor, current and voltage variations across each component with respect to frequency.

UO 3.2: Students will able to design R-L-C parallel resonant tank circuit for different frequencies and evaluate Q factor, current and voltage variations across each component with respect to frequency

Unit 4

UO 4.1: Students will able to determine Z,Y, h and ABCD parameters of two port n/w and convert these parameters of two port n/w into each other.

UO 4.2: Students will able to determine parameters of Series connected / Parallel connected / Cascade connected/ Series-Parallel connected Two-Two port networks.

UO 4.3: Students will understand concept of complex frequency, significance of poles & zeros and determine system stability.

UO 4.4: Students will able to determine Restrictions on poles & zeros for transfer & driving points function

Unit 5

UO 5.1: Students will able to Design &analyze constant K filters (LPF, HPF, BPF and BSF) T & Pi sections.

UO 5.2: Students will able to Design &analyze M-Derived filters (LPF, HPF, BPF and BSF) T & Pi sections

UO 5.3: Students will able to design different types of attenuators

Unit 6

UO 6.1: Students will able to analyze Step or DC response of RC/RL/R-L-C series circuit

UO 6.1: Students will able to analyze Sinusoidal or AC responseof RC/RL/R-L-C series circuit

Title of the Course: Electronic Measurement And Instrumentation	L	T	P	Credit
Course Code: UELN0305	3	0	-	3

Course Pre-Requisite:

Basics of passive components, principles of electricity, Magnetism, heat, lights and materials.

Course Description:

This course will help to develop skills to measure electrical parameters using various instruments. By learning this course students will able to know basics of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instruments.

Course Objectives:

1. To understand the working of basic measurement system and sources of errors in measurement system.
2. To study static and dynamic characteristics of instrument.
3. To study the operation & applications of different testing & measuring instruments.
4. To understand the working principle of sensors and transducers.
5. To study the operation & design of bridge circuit.
6. To study the operation of DAS & data convertors.

Course Learning Outcomes:

CO	After the completion of the course the student will able to	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO1	**Explain** the principle of operation of generalized measurement system and different sources of errors in measurements.	II	Understanding
CO2	**Analyze**different static and dynamic characteristics of instrument & based on this will able to select particular instrument for measurement.	IV	Analyzing
CO3	**Define** units and standards, their conversions, characteristics and error analysis of measurement systems.	I	Remembering
CO4	**Classify** and **select** transducer for particular application	V	Evaluating
CO5	**Design** AC and DC bridges for relevant parameter measurement.	VI	Creating
CO6	**Demonstrate** the use of Signal Generators, analyzers, frequency counter, CRO, DAS, ADC and DAC for appropriate measurement.	II	Understanding

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		2												
CO3												2		
CO4												2		
CO5	2	2	3					2						2
CO6									2	1				2

Assessments :

Teacher Assessment:

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

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% weight-age for course content

(normally last three modules) covered after MSE.	
Course Contents:	
Unit 1:---Basics of Measurement Systems Introduction, definition of measurement, definition of instrumentation, generalized block diagram of measurement system, different sources of errors in measurement, calibration of instruments, performance characteristics of instruments – static characteristics, dynamic characteristics, accuracy and precision, statistical analysis of data, arithmetic mean, deviation, average and standard deviation, probable error.	6 **Hrs.**
Unit 2:---Analog and Digital Measurements Analog instruments- classification, PMMC, MI, MC – construction, working principle etc, range extension. Digital Instruments- Digital Voltmeter- ramp type DVM, integrating type DVM, successive approximation type DVM, DFM, DMM, Digital Tachometer, Line mains frequency indicator.	7 **Hrs.**
Unit 3:---Oscilloscopes and signal generators Digital Storage Oscilloscope- Block diagram, Working principle, measurement, Parameters. Types of CRO: Dual Beam, Dual Trace, CRO probes. Signal generators- introduction, audio frequency generators, radio frequency generators, function generator, pulse and square wave generators.	7 **Hrs.**
Unit 4:--- Transducers Classification; Selection of Transducers; Resistive Transducers – Potentiometer, Strain gauges, Rosettes, Thermistor and RTD; Capacitive Transducers – Measurement of Liquid level by change in variation of dielectric constant; inductive transducers-LVDT; Piezoelectric Transducers; Photoelectric Transducers; thermocouple, pressure transducers, load cell, Digital displacement Transducer, advanced industrial and commercial sensors	7 **Hrs.**
Unit 5:--- AC and DC Bridges DC Bridges- Introduction, Wheatstone bridge, Kelvin's bridge sensitivity and limitations. AC Bridges- Introduction, Maxwell's bridge, Hay's bridge, Andersons bridge, Schering bridge, wein bridge	7 **Hrs.**
Unit 6:--- Data Acquisition Systems Introduction to signal conditioning, various signal conditioning circuits, , S/H Circuits, Introduction To Data Acquisition System, Various DAS Configurations, Single Channel DAS, Multi-Channel DAS, IC Based DAS, Data Acquisition, Data Acquisition in PLC. Signal analyzers-Introduction, basic wave analyzer, heterodynes harmonic distortion analyzer, Logic Analyzer.	8 **Hrs.**

Textbooks:

1. A. D. Helfik , W. N. Cooper, "Modern electronic instrumentation & measurement techniques", Pearson education

References:

1. A. K.Sawhney. "A course in electrical & electronics measurements & instruments", DhanpatRai & sons publication.
2. S. N.Patil,K.P. Pardesi "Electronics measurements & instrumentation", Electrotech publication.
3. H.S.Kalsi, "Electronics instrumentation", second edition, Tata McGraw Hill publication.
4. Alok Barua, "Fundamentals of industrial instrumentation", Wiley India publication.
5. David A.Bell, "Electronics instrumentation & measurements", 3rd edition Oxford publication.
6. M.M.S.Anand, "Electronics instruments & instrumentation technology", PHI publication.

Unit wise Measurable students Learning Outcomes:

1. Student would able to different terms and parameters in Measurement system
2. Student should beable to analyze Static and dynamic Characteristics with their error format in

an Instrument.
3. Student should beable to select Components and instrument for testing different Measurement
4. Student should beable to choose transducer to measure physical parameters.
5. Student should beable to Design AC &DC bridges for measurement of Parameters of different components.
6. Student should beable to Interpret the requirements of Data Acquisition system.

Audit Course-I

Shivaji University, Kolhapur

Second year undergraduate compulsory course in

ENVIRONMENTAL STUDIES

Course Code: UELN0361

Lecture: 02 Syllabus

Syllabus

1. Nature of Environmental Studies. (4 lectures)
Definition, scope and importance,Multidisciplinary nature of environmental studies,Need for public awareness.

2. Natural Resources and Associated Problems. (4 lectures)
a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems.
e) Energy resources: Growing energy needs, renewable and non-renewable 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.Roleof an individuals in conservation of natural resources.

3. Ecosystems (6 lectures)
Concept of an ecosystem.Structure and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.Ecologicalsuccession.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. Biodiversity and its conservation (6 lectures)
Introduction- Definition: genetic, species and ecosystem diversity.Bio-geographical classification ofIndia.Valueof biodiversity: consumptive use, productive use, social, ethical,aesthetic and option values.India as a mega- diversity nation.WesternGhat as a biodiversity region.Hot-spot ofbiodiversity.Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts.Endangered and endemic species ofIndia.Conservationof biodiversity: In-situ and Ex-situ conservation of biodiversity.

5. Environmental Pollution (6 lectures)
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 ofa individual in prevention of pollution.

6. Social Issues and the Environment (8 lectures)
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.Wastelandreclamation.Consumerism and waste products.

7. Environmental Protection (8 lectures)

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.

References :

1) Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2) BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt.Ltd.,Ahmedabad 380013, India, Email:mapin@icenet.net (R)
3) Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4) Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)
5) Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001,Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
6) De A.K., Environmental Chemistry, Wiley Wastern Ltd.
7) Down to Earth , Centre for Science and Environment , New Delhi.(R)
8) Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev.,Environment& Security. Stockholm Env. Institute. Oxford Univ. Press 473p
9) Hawkins R.E., Encyclopediaof Indian Natural History, Bombay Natural History Society, Bombay (R)
10) Heywood, V.H.& Watson, R.T.1995, Global Biodiversity Assessment,Cambridge Univ. Press 1140p.
11) Jadhav, H.and Bhosale, V.M.1995, Environmental Protection and Laws,Himalaya Pub. House, Delhi 284p.
12) Mickinney, M.L.and School. R.M.1196, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
13) Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
14) Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA,574p.
15) Rao M.N.and Datta, A.K.1987, Waste Water Treatment, Oxford &IBHPubl. Co. Pvt. Ltd., 345p
16) Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse,
Meerut
17) Survey of the Environment, The Hindu (M)
18) Townsend C., Harper, J. and Michael Begon, Essentials ofEcology,Blackwell Science (TB)
19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines,Compliances and Standards, vol. I and II, Environmental Media (R)
20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB)
21) Wagner K.D.,1998, Environmental management, W.B. Saunders Co.Philadelphia, USA 499p.
22) Paryavaran shastra – Gholap T.N.
23) ParyavaranSahastra - Gharapure

(M) Magazine
(R) Reference
(TB) Textbook

Title of the Course:Electronics Devices and Circuits LAB Course Code:UELN0331	L 0	T 0	P 2	Credit 1

Course Pre-Requisite:
Basic knowledge of Electron physics, Electrical Engineering.

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

Course Objectives:

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

Course Learning Outcomes:

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

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	2	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	"-"
CO2	2	2	3	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	3
CO3	2	2	3	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	3
CO4	2	1	2	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	3
CO5	1	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	50
ESE	50

ISE are based on practical performed/ Quiz/ Lab assignments/ Presentations/ Group Discussions/ Internal oral etc.
ESE: Assessment is based on oral examination and lab experimentation.

Course Contents:

Experiment No. 1:--- **Aim and Objectives:** To Study of VI characteristics of PN junction diode. **Outcomes:** The students will be able toplot V-I Characteristics of the PN Junction Diode for the both Forward and Reverse Bias conditions. **Theoretical Background:** Theoryof V-I characteristics of diode. **Experimentation:** Characteristics of PN Junction Diode	2**Hrs.**

Results and Discussions: Observed Waveforms and noted analysis Parameters **Conclusion:**Implemented circuit and observed the result	
Experiment No. 2:--- **Aim and Objectives:** To Study of V-I characteristics ofzener junction diode. **Outcomes:** The students will be able toplot V-I Characteristics of the zener Diode for the both Forward and Reverse Bias conditions. **Theoretical Background:** Theoryof V-I characteristics ofzener diode. **Experimentation:** Characteristics ofzener Diode **Results and Discussions:** Observed Waveforms and noted analysis Parameters **Conclusion:**Implemented circuit and observed the result	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:** To Study of full wave rectifier. **Outcomes:** The students will be able to deign and evaluate full wave rectifier. **Theoretical Background:**Theoryand operation principle of Rectifiers **Experimentation:** Analysis,designing and implementation of full wave rectifier **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented rectifier circuits and observed the result	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:** To Study of C-filter using full wave rectifier. **Outcomes:** The students will be able to deign and evaluate C-filter using full wave rectifier. **Theoretical Background:**Theoryand operation principle of C-filter **Experimentation:** Analysis,designing and implementation ofC-filter using full wave rectifier **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented C-filter using full wave rectifier circuits and observed the result	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives:** To Study of L-filter using full wave rectifier. **Outcomes:** The students will be able to deign and evaluate L-filter using full wave rectifier. **Theoretical Background:**Theoryand operation principle of L-filter **Experimentation:** Analysis,designing and implementation ofL-filter using full wave rectifier **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented L-filter using full wave rectifier circuits and observed the result	2**Hrs.**
Experiment No. 6:--- **Aim and Objectives:** To Study of LC-filter using full wave rectifier. **Outcomes:** The students will be able to deign and evaluate LC-filter using full wave rectifier. **Theoretical Background:**Theoryand operation principle of LC-filter **Experimentation:** Analysis,designing and implementation of LC-filter using full wave rectifier **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented LC-filter using full wave rectifier circuits and observed the result	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives:** To Study of different types of clipper circuits. **Outcomes:** The students will be able to compare different types of clipper circuits. **Theoretical Background:** Theoryand operation principle of different types of clipper circuits **Experimentation:** Analysis and implementation of different types of clipper circuits. **Results and Discussions:** Observed Waveforms. **Conclusion:** Implemented different types of clipper circuits and observed waveforms.	2**Hrs.**
Experiment No. 8:--- **Aim and Objectives:** To Study of different types of clamping circuits. **Outcomes:** The students will be able to compare different types of clamping circuits. **Theoretical Background:** Theoryand operation principle of different types of clamping	2**Hrs.**

circuits. **Experimentation:** Analysis, implementation of different types of clipper circuits. **Results and Discussions:** Observed Waveforms. **Conclusion:** Implemented different types of clamping circuits and observed waveforms.	
Experiment No. 9:--- **Aim and Objectives:** To determination of H-parameter for CE configuration using input and output characteristics **Outcomes:** The students will be able to determine H-parameter for CE configuration using input and output characteristics **Theoretical Background:** Knowledge of hybrid model for different configurations of transistors. **Experimentation:** Analysis,designing and implementation of CE configuration **Results and Discussions:** Noted input, output voltages and currents. **Conclusion:** Implemented rectifier circuits and plotted input output characteristic graph to obtain h-parameters practically.	2**Hrs.**
Experiment No. 10:--- **Aim and Objectives:** To study frequency response of single stage RC coupled amplifier. **Outcomes:** The students will be able to plot frequency response of single stage RC coupled amplifier **Theoretical Background:**Theory and operation principle ofsingle stage RC coupled amplifier **Experimentation:** Analysis,designing and implementation ofsingle stage RC coupled amplifier **Results and Discussions:** Noted output voltage for different frequencies. **Conclusion:** Plotted frequency response for single stage RC coupled amplifier And observed three different frequency regions of an amplifier.	2**Hrs.**
Experiment No. 11:--- **Aim and Objectives:** To design and frequency response of two stage RC coupled amplifier **Outcomes:** The students will be able to plot frequency response of two stage RC coupled amplifier **Theoretical Background:** Theory and operation principle oftwo stage RC coupled amplifier **Experimentation:** Analysis, designing and implementation ofof two stage RC coupled amplifier **Results and Discussions:** Noted output voltage for different frequencies. **Conclusion:** Plotted frequency response for two stage RC coupled amplifier And observed three different frequency regions of an amplifier.	2**Hrs.**
Experiment No. 12:--- **Aim and Objectives:** To design and frequency response of two stage RC coupled amplifier with feedback **Outcomes:** The students will be able to plot frequency response of two stage RC coupled amplifier with feedback **Theoretical Background:** Theory and operation principle oftwo stage RC coupled amplifierwith feedback **Experimentation:** Analysis, designing and implementation ofof two stage RC coupled amplifier with feedback **Results and Discussions:** Noted output voltage for different frequencies. **Conclusion:** Plotted frequency response for two stage RC coupled amplifier And observed three different frequency regions of an amplifier.	2**Hrs.**
Textbooks: 1. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj. 2. Electronic Devices and Circuits by Anil K. Maini, Varsha Agarwal- Wiley India. 3. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi. 4. Electronic Devices and Circuits by Mantri & Jain.	
References:	

2. Electronic Devices and Circuit Theory by Boylestad.
3. Electronic Devices and Circuits by J.B.Gupta.
4. Pulse, Digital & Switching Waveforms by Millman, Halkias, TMH.
5. Schaum's Outlines, " Electronic Devices and Circuits"
6. Electronic Devices and Circuits by Allen Mottershead-PHI.
7. Solid State Electronic Devices by Ben Streetman,Pearson.

Experiment wise Measurable students Learning Outcomes:

1. The students will be able to plot V-I characteristics of P-N junction diode
2. The students will be able to plot V-I characteristics of Zener diode
3. The students will be able to design and evaluate full wave rectifier.
4. The students will be able to design and evaluate C-filter using full wave rectifier.
5. The students will be able to design and evaluate L-filter using full wave rectifier.
6. The students will be able to design and evaluate LC-filter using full wave rectifier.
7. The students will be able to compare different types of clipper circuits.
8. The students will be able to compare different types of clamping circuits.
9. The students will be able to determine H-parameter for CE configuration using input and output characteristics
10. The students will be able to plot frequency response of single stage RC coupled amplifier.
11. The students will be able to plot frequency response of two stage RC coupled amplifier
12. The students will be able to plot frequency response of two stage RC coupled amplifier with feedback

Title of the Course: Electronic Measurement And Instrumentation	**L**	**T**	**P**	**Credit**
Course Code:UELN 0332	**0**	**0**	**2**	**1**

Course Pre-Requisite: Basic Understanding of passive components, Hands on experience of handling DMM

Course Description:

This course will help to handle analog and digital instruments. The course will help student understand the working and application of various transducers. Students will help in understanding the working of PLC and DAS.

Course Objectives:

1. To understand the measurement of electrical parameters using CRO and DSO
2. To study the operation &use of different transducers
3. To understand measurement of parameters such as R, L, C with the help of AC, DC bridges
4. To study the working of PLC and Data Acquisition System

Course Learning Outcomes:

CO	**After the completion of the course the student will able to**	Bloom's Cognitive	
		Level	Descriptor
CO1	**Explain** the measurement of electrical parameters using CRO and DSO	**II**	**Understanding**
CO2	**Analyze**the operation and use of various transducers	**IV**	**Analyzing**
CO3	**Explain**the measurement of R,L,C with the help of AC,DC bridges	**II**	**Understanding**
CO4	**Explain** the working of PLC and DAS	**II**	**Understanding**

CO-PO Mapping:

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

Assessments : ISE (50 Marks)

Total Marks : 50	
Project Based Learning (25 Marks)	Laboratory Experiment work (25 Marks)
Project Evaluation Committee (10 Marks)	Journal Completion (10 Marks)
Project Work (10 Marks)	Oral (10 Marks)
Report (5 Marks)	Quiz (5 Marks)

Project Evaluation Committee :

- Project Evaluation committee will analyze the work done by the project group and viva will be taken based on the project.
- Project Work will be evaluated based on the rubrics designed.
- Each project group has to submit a report on the project (Max.10 Pages)

Course Contents:	
Experiment No. 1:---Study of Cathode Ray Oscilloscope **Aim and Objectives: To Measure electrical parameters using CRO** **Outcomes:**Hands on experience and understanding of functions of CRO	02 **Hrs.**
Experiment No. 2:--- Measurement of frequency and phase using Lissageous patterns **Aim and Objectives:** frequency and phase measurement **Outcomes:**Understand the Lissajeous pattern experimentally **Theoretical Background:** working of oscilloscope **Experimentation:** • Calibrate the instrument first • Make connections • Vary the frequency and obtain Lissajeous pattern • Measure unknown frequency and phase	02 **Hrs**
Experiment No. 3:---Study of digital storage oscilloscope **Aim and Objectives: Measure electrical parameters using DSO** **Outcomes:**Hands on experience and understanding of functions of DSO	02 **Hrs**
Experiment No.4:---Study of temperature transducers: a) RTD b) Thermistor **Aim and Objectives:** Measure temperature using above devices **Outcomes:** able to measure temperature **Theoretical Background**: Working principle of RTD, Thermistor **Experimentation:** • Calibrate the instrument first	
• Connect the RTD in bridge circuit • Increase temperature • Record DPM reading • Find the slope of graph **Results and Discussions:** -- After completion of this experiment student will learn how to measure temperature using above devices. **Conclusion:** RTD is a PTC device, Thermistor is a NTC device and thermocouple gives linear relationship between temp. and output	02 **Hrs**
Experiment No. 5:---Study of temperature using Thermocouple **Aim and Objectives:** Measurement of Temperature **Outcomes:** able to measure Temperature **Theoretical Background:** working principle of Thermocouple	02 **Hrs.**

Experiment No. 6:---Study of AC and DC bridges: (Any one) a) Whetstones' bridge c) Wein bridge **Aim and Objectives:** finding unknown resistance and unknown impedances **Outcomes:** unknown resistance and unknown impedances **Theoretical Background:** working of Whetstones' bridge and Wein bridge **Experimentation:** • Calibrate the instrument first • Make connections • Vary the resistance and balance the bridge • Measure unknown resistance and record it **Results and Discussions:** -- After completion of this experiment student will learn how to measure unknown resistances and impedances	02 **Hrs.**
Experiment No. 7:---Study of weight measurement using strain gauge **Aim and Objectives:** measurement of weight **Theoretical Background:** working principle of strain gauge, load cell etc. • **Experimentation:** • Calibrate the instrument first using gain control knob • Connect strain gauges with correct polarity • Vary the weight in ascending and descending order • Record DPM reading • Find the slope of graph	
Experiment No. 8:---Study of DAC using R-2R ladder network	02 **Hrs.**
Experiment No. 9:---Study of DAC using R-2R ladder network	02 **Hrs.**
Experiment No. 10 :-- Study of measurement of Capacitance using Schering Bridge	02 **Hrs.**
Experiment N0.11 :-- Study of PLC	02 **Hrs.**

Textbooks:

A. D. Helfik , W. N. Cooper, "Modern electronic instrumentation & measurement techniques", Pearson education

References:

1. A. K. Sawhney. "A course in electrical & electronics measurements & instruments", Dhanpat Rai & sons publication.
2. S. N.Patil,K.P. Pardesi "Electronics measurements & instrumentation", Electrotech publication.
3. H.S.Kalsi, "Electronics instrumentation", second edition, Tata McGraw Hill publication.
4. Alok Barua, "Fundamentals of industrial instrumentation", Wiley India publication.
5. David A.Bell, "Electronics instrumentation & measurements", 3rd edition Oxford publication.
6. M.M.S.Anand, "Electronics instruments & instrumentation technology", PHI publication.

Unit wise Measurable students Learning Outcomes:

1. Student would able to different terms and parameters in Measurement system
2. Student should beable to analyze Static and dynamic Characteristics with their error format in an Instrument.
3. Student should beable to select Components and instrument for testing different Measurement
4. Student should beable to choose transducer to measure physical parameters.
5. Student should beable to Design AC &DC bridges for measurement of Parameters of different components.
6. Student should beable to Interpret the requirements of Data Acquisition system.

Title of the Course: Digital Design using HDL Laboratory Course Code:UELN0333	L	T	P	Credit
	0	0	2	1

Course Pre-Requisite: Knowledge oflogic gates, number systems viz. Binary, octaland hexadecimal, Basics of PC and programming, familiarity with Multimeter and oscilloscope.

Course Description:

This course covers hands on experience of interconnection ofgates, building logic circuits and Sequential circuits by wiring on kits and programming on PC in VHDL and downloading on FPGA and testing.

Course Objectives:

1. To implement combinational and sequential logic design using LSI, MSI logic families.
2. To motivate students to use EDA tools for design and simulation.
3. To develop the methodology for digital design using VHDL.
4. To implement combinational and sequential logic design using CPLD, FPGA.

Course Learning Outcomes:

CO	After the completion of the course the student will able to	Bloom's	
		Level	Descriptor
CO1	Implement combinational and sequential logic circuitsusing LSI, MSI logic families.	VI	Creating
CO2	Design and simulate logic using HDL and EDA tools.	VI	Creating
CO3	Design and test digital logic using VHDL.	VI	Creating
CO4	Implement digital logic using CPLD and FPGA.	VI	Creating

CO-PO Mapping:

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

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	50
ESE	50

ISE is based on practical performed/ Quiz/Lab Assignments / Presentation/ Group Discussion/ Internal oral etc.

ESE: Examination is based on practical and oral examination.

Course Contents:	
Note: Minimum of 15 experiments to be conducted on Digital IC Trainer and Programming in VHDL in different modelling styles in VHDL (Dataflow, Behavioural and Structural Modelling). **Experiments should be on the following topics.** Design of Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, ALU, S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Pseudo Random Binary Sequence generator, in different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling	

Title of the Course:Computer Aided Design LAB	L	T	P	Credit
Course Code: UELN0334	-	-	2	1

Course Pre-Requisite:

1. GUI based PC software handling
2. Understanding of Network analysis.

Course Description:

Analysis and design of RC, RL, and RLC electrical networks. Sinusoidal steady state analysis of passive networks, mesh and nodal analysis, 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.

Course Objectives:

The course aims to:

1 Provide an introduction to P-Spice & simulation andCAD 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.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	Identify/select various components from different libraries for schematic entry.	III	Applying
CO2	Analyze electronics devices and circuits using CAD tools	IV	Analyzing
CO3	Create a PCB layout of the given circuit using CAD tools.	V	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					3									
CO2					3								2	2
CO3					3								2	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	50
ESE (POE)	50

ISEis based on practical performed/ Quiz/ Lab assignment/ Presentation/ Group Discussion/ Internal oral etc.

ESE: Examination is based on practical and oral examination.

Course Contents:

Introduction, Description of P-Spice and OrCAD, Types of analysis, Description of simulation software tools (like OrCAD / PROTEL / Proteus / Microcap) 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

Circuit Elements: Voltage and Current, Electrical Resistance, Ohm's law, Model Circuit Types of Analysis: Bias point, Time domain, AC Sweep, DC Sweep, Parametric, Noise analysis, Kirchhoff's Laws, Analysis of Circuits with a Dependent Source

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.

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.
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

Inductors and Capacitors: The Inductor, The Capacitor, Series-Parallel Combinations of Inductance and Capacitance.

Filters: HPF, LPF, BPF, BSF frequency response. Magnitude and Phase Plots.

Response of First-Order RL and RC Circuits: The Natural Response of an RL Circuit, The Natural Response of an RC Circuit.

Response of First-Order RL and RC Circuits: The Step Response of RL and RC Circuits, A General Solution for Step and natural Response

Natural and Step Response of RLC Circuits: The Natural Response of a Parallel RLC Circuit, The Step Response of a Parallel RLC Circuit

Natural and Step Response of RLC Circuits: The Natural Response of a Series RLC Circuit, The Step Response of a Series RLC Circuit

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

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 .

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 10 Experiments must be conducted from the topics based on syllabus.

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.
2. W.C. Bosshart 'Printed Circuit Boards-Design & Technology'–Tata McGraw-Hill Publication

Title of the LAB: Micro project 1 LAB (Social problem solutions) Course Code: UELN0351	L	T	P	Credit
	0	0	2	1

LAB Pre-Requisite:
First Year engineering, 3D printing, Basics of electronics (Bread boarding, soldering, testing), C programming etc.

LAB Description:
This lab prepares students to develop thinking process to solve social problems by application of science and engineering in innovative manner. The group of students not more than 3 should identify social problems, perform requirement analysis. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and objectives of micro-project. As per requirements the group should develop specifications offinal outcomeof 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 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.
This LAB will help to develop sensitivity of students towards social problem, think critically to find innovative solutions to simplify human life
Completed micro project and documentation in the form of micro project report is to be submitted at the end of semester. The project should complete in 12 weeks including field trails if any.
At the end ofproject the guide should advise students to protect IP either in the form of Patent or registration of design or 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 reduction, prosthesis, smart city, smart transportation.
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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 C 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 will able to	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO1	Identify social problem that can be implantable using first principles of science, engineering and skills like AUTOCAD, C Programming, basics of electronics (components soldering and testing using test equipment)	II	Evaluating
CO2	Analyze and build logical/ mathematical/ mechanical model of the project.	IV	Analyzing
CO3	Design / simulate the model/ project work	I	Designing
CO4	Implement the project using resources available in project LAB	VI	Creating
CO5	Developcomprehensive report on project work as per prescribed format	VI	Creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3				2						1		2
CO2	2													2
CO3			3				2							2
CO4					3									2
CO5									2	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	50
ESE	50

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

ESE: Assessment is based on oral examination

Title of the Course: Linear Integrated Circuits Course Code:UELN0401	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basic knowledge of Electronic Devices.

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

Course Objectives:

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

CO	After the completion of the course the student should be able to	Bloom's level	Bloom's Descriptor
CO1	**Define** Op-AMP parameters and characteristics.	I	Remembering
CO2	**Select** appropriate analog ICs by reviewing data sheets for industrial and domestic applications	I	Remembering
CO3	**Analyze** BJT Operational amplifier for DC and AC inputs.	II	Analyzing
CO4	**Design**of amplifiers, signal conditioners, filters and oscillators using op-amp circuits.	VI	Creating
CO5	**Build** wave shaping circuits using op-amp.	VI	Creating

CO-PO Mapping:

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

Assessments :

Teacher Assessment:

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

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

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

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

ESE: Assessment is based on 100% course content with 60-70% Weightage for course content (normally last three modules) covered after MSE.	
Course Contents:	
Unit 1:--- **Differential Amplifiers** Differential Amplifier-Configuration, DC & AC Analysis of Dual Input Balanced Output Configuration. Comparative study of other configuration of Differential amplifiers, Constant Current Bias, Current Mirror, DC coupling & Cascade differential stages, Level Translator & its need.	**06 Hrs.**
Unit 2:--- **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. Comparative study of Data Sheets – μA 741, OP 07, LM 324, LM 311, LM 308, LM380, CA 3140.	**08 Hrs.**
Unit 3:--- **Negative Feedback In Op-Amps:** Open Loop & closed Loop- Inverting, Non-Inverting and Differential (Using one op-amp). Analysis for Av, Ri, Ro, Bandwidth, and Total output offset voltage. AC & DC amplifiers – all configurations.(Numericals are expected).Open loop frequency Response, closed loop frequency response, circuit stability, slew rate.	**07 Hrs.**
Unit 4:--- **Op-amp Applications** Summing amplifier (Inverting & Non-Inverting), Subtractor, Integrator, Differentiator, Instrumentation Amplifier (3 op-amps), Instrumentation amplifier using transducer bridge, Single Chip Instrumentation Amplifier (INA Series), 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.	**09 Hrs.**
Unit 5:--- **V Active Filters** First & Second Order Butterworth Low Pass, High Pass, Band Pass, Band Reject, & All Pass Filters (Analysis &Numericals are Expected).	**04 Hrs.**
Unit 6:---Specialized IC Applications Sine wave generator- RC phase Shift, Wein Bridge, & Quadrature oscillator. Square wave (AstableMultivibrator), Monostable 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. IC 8038 Waveform generator (Numericals are expected).	**06 Hrs.**
Textbooks: 1 Ramakant. A. Gayakwad, "Op-Amps & Linear Integrated Circuits", 3rd Edition, PHI. 2 S.Salivahanan&Bhaaskaran, "Linear Integrated Circuits", 1st Edition, Tata McGraw Hill.	
Reference Books: 1. National Analog & Interface products Data book—National Semiconductors 2. Sergio Franco, "Design with op-amp & Analog Integrated Circuits", 3rd Edition, Tata McGraw Hill. 3. K.R.Botkar."Integrated Circuits" Khanna publications, 10th Edition. 4. David. A. John & Ken Martin, "Analog Integrated Circuit Design", Student Edition, Wiley. 5 Roy Choudhary &Shail. B. Jain, "Linear Integrated Circuits",2nd Edition, New Age.	

Unit wise Measurable Students Learning Outcomes:

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

Title of the Course:Analog Circuit Design	L	T	P	Credit
Course Code:UELN0402	4	-	-	4

Course Pre-Requisite:

Basic knowledge of mathematics, semiconductor physics will be beneficial

Course Description:

This course contains fundamentals ofSemiconductor devices and various electronic circuits; This course enables to students to analyze and design of basic application circuits such as oscillators, multivibrators, and power amplifiers by using transistor.

Course Objectives:

1. To study FET, it's types, construction and working principle.
2. To understand various types of power amplifiers.
3. To understand working principle of various regulators and power supplies.

Course Learning Outcomes:

CO	After the completion of the course the student should beable to	Bloom's Cognitive level	Descriptor
CO1	Analyze transistor applications as oscillator and multivibrator.	IV	Analyzing
CO2	Design oscillators and multivibrators.	VI	Creating
CO3	State working principal of power amplifiers and classification.	II	Understanding
CO4	Explain working principle of various regulators and power supplies.	V	Evaluation

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	1	2	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	2
CO2	1	1	3	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	3	3
CO3	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	"-"
CO4	2	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
ISE 1	10
MSE	30
ISE 2	10
ESE	50

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

Course Contents:

Unit 1:-FET(Field Effect Transistor):	6 **Hrs.**
JFET: Types, Construction, operation, V-I characteristics, Parameters of JFET,	

Biasing of JFET, analysis of Common Source Amplifier (CS) amplifier. MOSFET: Configuration, construction and operation of different MOSFET (NMOS, PMOS), Transfer Characteristics, Comparison of FET, BJT & MOSFET.	
Unit 2:---Oscillators Oscillators: Barkhausens' Criteria, Frequency and amplitude Stability, classification of oscillator (RC Oscillators, LC Oscillators), Crystal Oscillator,.	8 **Hrs.**
Unit 3:---Multivibrators Multivibrators: Classification of Multivibrators, Triggering Methods: Symmetrical and Unsymmetrical, Schmitt Trigger	8 **Hrs.**
Unit 4:---Power Amplifiers: Power Amplifiers, Need of power amplifiers, Classification of power amplifier: Class A, Class B, Class C, Class AB, concept of Cross over distortion, methods to eliminate Cross over distortion, Complimentary symmetry amplifiers.	9 **Hrs.**
Unit 5---Linear Power Supplies: Need of Voltage Regulator, Stabilization factor, Analysis of Shunt regulator (using Zener diode & BJT), Emitter follower regulator, series voltage regulator (using BJT), Series voltage regulator with Pre- regulator, Short circuit & Overload protection circuit. IC regulators: Study of regulators using 78XX & 79XX, LM317, IC 723.	**9 Hrs.**
Unit 6:--Switch Mode Power Supplies: Introduction of SMPS, comparison of SMPS with linear power supply, SMPS topologies,Step-down SMPS, Step -up SMPS, Polarity Inversion, Push-pull, etc, Detail study of LM3524.	8 **Hrs.**

Textbooks:

1. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj.
2. Electronic Devices and Circuits by Anil K. Maini, Varsha Agarwal- Wiley India.
3. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi.
4. Electronic Devices and Circuits by Mantri & Jain.

References:

1. Pulse, Digital & Switching Waveforms by Millman, Taub, Rao.
2. Schaum's Outlines, " Electronic Devices and Circuits"
3. Electronic Devices and Circuits by Allen Mottershead-PHI.
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. Solid State Electronic Devices by Ben Streetman, PearsonPublication.

Unit wise Measurable students Learning Outcomes:

1The student will be able tomake use of semiconductor devices as per industry practice in a satisfactory manner

2. The student will be able to analyze and design various applications of bipolar junction transistors such as oscillators,

3. The student will be able to analyze and design various applications of bipolar junction transistors such asmultivibrators,

4 The student will be able to explain and analyze various types of power amplifiers.

5 The student will be able to define various regulator circuits

6. The student will be able to describe SMPS

Title of the Course:Control System Engineering	L	T	P	Credit
Course Code:UELN0403	3	-	-	3

Course Pre-Requisite: Knowledge of Derivative, Integration, Matrices and Laplace transform.

Course Description:

The course studies dynamic systems encountered in a variety of instrumentation and Mechatronics systems, the modelling of such systems and the response of these systems to a disturbance. In addition, the control of dynamic systems using feedback and the design of control systems using different design techniques will be studied.

Course Objectives:

Objectives of this course are:

1. To study the fundamental concepts of Control systems and mathematical modeling of the system.
2. To study the concept of time response and frequency response of the system.
3. To study the basics of stability analysis of the system.

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CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	Analyze mathematical models of mechanical and electrical systems by their transfer functions using differential equations.	IV	Analyzing
CO2	Analyze time domain and frequency domain systems with response to test inputs.	IV	Analyzing
CO3	Determine the stability of the systems by using Routh's criteria, Nyquist criteria, Bode plot and root locus.	V	Evaluating
CO4	Design of automated system using PLC and PID.	VI	Creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	3												
CO2		3												
CO3		2												
CO4					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 and 30-40 % weightage of first three units.

Course Contents:	
Unit 1:---Introduction to Feedback Control System Classification of control System, Mathematical models of physical system-Electrical & Mechanical System , Transfer function of electrical and Mechanical systems, Block diagrams and reduction techniques, signal flow graphs using Mason's gain formula.	06 **Hrs.**
Unit 2:---: Feedback characteristics of Control system Feedback & Non-feedback systems, Reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, control of effect of disturbance signals by use of feedback, The concept of stability, Routh Hurwitz stability criteria.	04 **Hrs.**
Unit 3:--- Time Domain Analysis Time response of first order & second order system using standard test signal, steady state errors and error constants, Root locus techniques- Basic concept, rules of root locus, application of root locus techniques for control system.	06 **Hrs.**
Unit 4:--- Frequency Domain Analysis Introduction, correlation between time & frequency domain, Bode plots, gain margin, phase margin, effect of addition of poles & zeros on bode plots, Nyquist stability. Stability using Bode plot.	06 **Hrs.**
Unit 5:--- State Space Analysis Concept of state, state variables & state model State-space representation, computation of the state transition matrix, transfer function from the state model, controllability of linear system, observability of linear system.	05 **Hrs.**
Unit 6:--- Compensators & controllers a. Compensators- Need of compensation, lead compensation, lag compensation, Lead-lag compensation. b. Introduction to PID controller. c. Introduction to PLC controller.	05 **Hrs.**
Textbooks: 1. I.J. Nagrath, M.Gopal "Control Systems Engineering", 5th Edition, New Age International Publication 2. R. Anandanatarajan, P. Ramesh Babu , "Control Systems Engineering", Scitech Publications . 3. A. Ananadkumar, "Control system Engineering" PHI publication 2nd edition. 4.John R. Hackworth,Fredrick D. Hackworth " Programmable Logic Controller" Pearson publication.	
References: 1. Norman S. Nise "Control Systems Engineering", 8th edition, Wiley edition. 2. Samarjeet Ghosh, "Control Systems Theory & Applications", 1st edition, Pearson education. 3. S.K. Bhattacharya, "Control Systems Engineering", 1st edition, Pearson education. 4. S. N. Shivanandan,S. N. Deepa," Control System Engineering" Vikas Publications 2nd edition 5.Dhanesh N. Manik" Control Systems" Cengage learning.	
Unit wise Measurable students Learning Outcomes: 1. The students will be able to determine transfer functions of physical system. 2. The students will be able to plot time response of first and second order system for a step input. 3. The students will be able to design and evaluate Bode plot using Lead Network. 4. The students will be able to design and evaluate Bode plot using Lag Network. 5. The students will be able to design and evaluate ON-OFF controller. 6. The students will be able to design and evaluatePID controller. 7. The students will be able to study PLC 8. The students will be able to plot response of first and second order system for a step and ramp input. 9. The students will be able to determine phase margin and gain margin 10. The students will be able to study MIMO systems.	

Title of the Course: Analog Communication Course Code:UELN0404	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: basic concepts of mathematics (trigonometry, Fourier series etc.), semiconductor devices.

Course Description:

This course will introduce communication signals representation in time domain and the frequency domain, basic concepts of analog modulation (AM, FM, and phase modulation), pulse 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	Bloom's Cognitive Descriptor
CO1	**Illustrate** different modulation schemes such as AM, FM, PM.	II	Understanding
CO2	**Apply** analytical methods to solve Numericals onAmplitude, frequency modulation and total power of transmitter.	III	Applying
CO3	**Test** the performance of radio receivers in terms of their characteristics.	VI	Creating
CO4	**Select** various pulse modulation techniques for various applications.	I	Remembering
CO5	**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	PO 12	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.

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:--- UNIT-I: Amplitude Modulation: (9 Hrs) Block diagram of communication system, base band signals, RF bands, Necessity of modulation, Amplitude Modulation principle, AM envelope, frequency spectrum & BW, phase representation of AM wave, Modulation index, % modulation (Numerical expected) AM modulating circuits: Low level AM modulation, medium power AM modulation, high power modulation(diode and transistor circuits), AM transmitters: Block diagram of low level DSBFC, High level DSBFC, Trapezoidal patterns,SSB, Suppression of carrier using balanced modulator, Suppression of unwanted sideband methods: Filter system, phase shift & third method, Quadrature Carrier Multiplexing(QAM),Vestigial sideband(VSB) in television system, ISB transmissions.	**-09Hrs.**
Unit 2:--- AM Receiver: (6 Hrs) Simplified block diagram of AM receiver, receiver parameters: Sensitivity, 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, Demodulation of SSB using: product demodulator & diode balanced modulator, Automatic Gain Control (AGC), Noise in AM.	**06 Hrs.**
Unit 3:--- Angle Modulation: (6 Hrs) Theory of frequency and phase modulation, mathematical analysis, deviation sensitivity, FM and PM waveforms, Representation of FM and PM signals, phase deviation and modulation index, frequency deviation and percentage modulation, Spectral characteristics of angle modulated signals, angle modulation circuits using varactor diode, PLL, using frequency analysis of angle modulated wave-Bessel function, BW requirements, deviation ratio, Noise in angle modulation,	**06Hrs.**
Unit 4:--- FM Receiver: (6 Hrs) Block diagram of Double conversion FM receivers, FM demodulator, tuned circuit frequency discriminators, slope detectors, fosters seeley discriminator, ratio detectors, PLL-FM demodulators, FM noise suppression,Pre emphasis and De emphasis in FM, Comparison of Noise Performance of different modulation schemes	**06 Hrs.**
Unit 5:--- Pulse Modulation: (5 Hrs) Pulse amplitude modulation, Sampling theorem & type: Natural & flat top, PAM modulation circuit, PAM demodulation circuit, TDM and FDM, Crosstalk in TDM, pulse time modulation, generation of PTM signals (direct-indirect method), PWM modulator, PPM modulators, demodulation of PTM.	**05 Hrs.**
Unit 6:--- Noise , Antenna and Wave Propagation: (8 Hrs) Noise types (Internal noise, external noise), Noise figure. 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 'IVth Edition-Pearson Education
2. V. Chandra Sekar, 'Analog Communication', Oxford university.
3. R P Singh, S D Sapre 'Communication System-Analog & Digital 'IInd Edition –Tata Mc Graw Hill Publication
4. B. P. Lathi, Zhi Ding, 'Modern Digital and Analog Communication Systems' 4th edition, Oxford university.
5. Blake, 'Electronics Communication Systems' 2nd edition, cengage Learning.

Unit wise Measurable students Learning Outcomes:

1. Students are able to explain concept of modulation and different types of Modulation.
2. Students are able to explain types of AM receiver and their working.
3. Students are able to differentiate FM and PM modulation and their types.etc.
4. Students are able to explain different types of FM Demodulation, types of AM receiver.
5. Students are able to explain difference between analog modulation and pulse modulation and advantages of pulse modulation over analog modulation.
6. Students are able to explain concept of Noise, their types etc. Students are also able to explain ground wave, space wave and sky wave. Antenna: basic consideration of radiation

Title of the Course: Signals & Systems Course Code: UELN0405	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basics of transform theory

Course Description: This course will equip students by learning the basic mathematical framework of signals and systems. Here we will explore the various properties of signals and systems, characterization of Linear Time Invariant Systems/ Time variant systems, convolution and Fourier Series and Transform, and also deal with the Parseval's theorem, Z-Transform, Correlation and Laplace transform. Ideas introduced in this course will be useful in understanding further Electronic/Electrical Engineering courses which deal with control systems, communication systems, digital signal processing, statistical signal analysis and digital message transmission

Course Objectives:

1. To prepare students with the understanding of basics of test signals, their properties and its effect on the practical systems, and also understand different properties of the system
2. To train students with problem solving capabilities such as analysis of the system and system output interpretation
3. To develop students understanding with different transform techniques those can be used for system realization

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	**Understand** and interpret different types of test signals and systems those system can encounter in day-to-days life	II	Understanding
CO2	**Explain** different properties and type of signals and system	II	Understanding
CO3	**Apply** different transform techniques to solve the system problems	III	Applying
CO4	**Evaluate** response of linear systems to any input signal by convolution in the time domain, and by transformation to the frequency domain, the concepts of auto correlation and cross correlation and power density spectrum.	V	Evaluating

CO-PO Mapping:

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

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:--- Basics of Signals & Systems Definition of signals, classification of signals, study of some standard signals viz. Impulse signal, step signal, ramp signal, rectangular pulse function, signum function, sinc function, exponential signal, properties of standard signals, basic operations on signals, Definition of system, classification of systems	6-- **Hrs.**
Unit 2:--- Linear Time Invariant Systems Concept of Eigen function in the development of convolution theory, properties of Eigen function, Concept of convolution in Discrete and Continuous time domain, concept of Linear Time Invariant systems and its properties, concept of correlation, Autocorrelation and Cross Correlation, similarity and difference between convolution and correlation, time domain analysis of CT systems	6-- **Hrs.**
Unit 3:---Fourier Series Representation of Signals Introduction to Continuous Time Fourier Series (CTFS), Direchlet's conditions for the existence of Fourier series, properties of CTFS, FS representation of Amplitude and Phase Spectrum, relation between Fourier series and Fourier Transform	6-- **Hrs.**
Unit 4:--- Fourier Transform (FT) Continuous Time and Discrete Time, Concept and interpretation of FT, concept of magnitude and phase spectrum, existence of Fourier series, properties of FT, analysis of LTI systems using FT	8-- **Hrs.**
Unit 5:---Laplace Transform (LT) Introduction to Laplace Transform, Existence of LT, Concept of Region of Convergence and its properties, definition of Inverse LT, Properties of LT, Analysis of CT-LTI systems using LT, stability and Causality of CT-LTI system using LT, block diagram representation and system realization of CT-LTI system	7-- **Hrs.**
Unit 6:---Z- Transform Introduction to Z Transform, Concept of Region of Convergence and its properties, Properties of Z Transform, Analysis of DT-LTI systems using Z Transform, stability and Causality of DT-LTI system using Z Transform, block diagram representation and system realization of DT-LTI system, Inverse Z Transform and time domain characteristics.	7-- **Hrs.**
Textbooks: 1. Signals & systems by B.P.Lathi	
References: 1. Signals and Systems (second edition) by Alan Oppenheim, Alan S. Willesky Pearson Publication 2. Signals and Systems, Simon Haykin	
Unit wise Measurable students Learning Outcomes: 1. Student should understand the Concept of signals and systems 2. Student should understand the concept of LTI system 3. Student should explain the concept of Fourier Series 4. Student should understand Fourier Transform 5. Student should understand the concept of Laplace transform 6. Student should explain the concept of Z-transform	

Title of the Course:Content Creation using Information and web Technologies Course Code:UELN0461	L	T	P	Credit
	2	-	-	0

Course Pre-Requisite: Awareness of computer programming and hardware resources.

Course Description:
This course encompasses the study of open source content creation software

Course Objectives:
1. To understand platforms open source content creation software
2. To create a blog using open source content creation software
3. To create a website using open source content creation software
4. Creating and editing video and uploading on designed web site

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Exploring open source software resources	II	Understanding
CO2	Create blogs and website on different themes using open source content creation software .	III	Applying , creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1			2			2			3					
CO2		3		3		2	3	1	3	3				

Assessments :

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1WORDPRESS BASICS Exploring basic WordPress Concepts, Various development and release cycles, WordPress Community, Different versions of WordPress	4**Hrs.**
Unit 2SETTING UP THE WORDPRESS SOFTWARE File transfer protocol, Introduction to PHP and MySQL, Installation of WordPress, Configurations for optimum performance and security, Upgrading WordPress, Backing Up, Packing Up, and Moving to New Host	4**Hrs.**
Unit 3 EXPLORINGTHE WORDPRESS DASHBOARD Dashboard Customization, Exploring tools and settings, Managing Users and multiple authors, dealing with components and spam, Building link list, Creating categories and tags	4**Hrs.**
Unit 4:-PUBLISHING SITE WITH WORDPRESS Writing post, examining difference between posts and pages, Uploading and displaying photos and galleries, exploring Podcasting and Video Blogging, Working with custom fields,WordPress as a content management System	5**Hrs.**

Textbooks:
1. WordPress For Dummies (For Dummies (Computer/Tech)) (English, Paperback, Lisa Sabin-Wilson, Matt Mullenweg)

References:
1. WordPress for Beginners 20XX: A Visual Step-by-Step Guide to Mastering WordPress

(Webmaster Series Book 2) by Dr Andy Williams
Unit wise Measurable students Learning Outcomes: 1. The student will be able to explain basics of WordPress. 2. The student will be able to set the WordPress software. 3. The student will be able to explore various tools from WordPress dashboard. 4. The student will be able to create blog by using WordPress.

Title of the Course: Linear Integrated Circuits LAB Course Code:UELN0431	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite: Basic knowledge of Electronic Devices

Course Description: This is a course on the design and applications of operational amplifiers and analog integrated circuits. Much attention is given to implementation of op-amp configurations, linear and non-linear applications of op-amp and active filter synthesis. It also deals with implementation of oscillators, waveform generators and data converters.

Course Objectives:

4. Explain the internal circuit of operational amplifier and its electrical parameters.
5. Indicate the importance of an Op-amp in building an analog computer.
6. Explain the application of Op-amps in building signal conditioning circuits, filters, waveform generators etc.
7. Develop practical skills for building and testing circuits using analog ICs.

Course Learning Outcomes:

1 Select an appropriate Op-amp for a particular application by referring data sheets.
2 Design Op-amp based circuit to give specified gain.
3 Explain the frequency response characteristics of an amplifier using Op-amp
4 Compute component values to design different Op-amp based circuits which include arithmetic building blocks, filters, waveform generators etc.
5 Solve numerical problems related to op-amp circuits.
6 Explain the working of various circuits for different applications designed using linear integrated circuits such as IC 741,IC555, IC565,IC566, CA3140and IC177, IC620
7 Demonstrate circuit design skills using analog ICs.

CO	After the completion of the course the student should be able to	Bloom's level	Bloom's Descriptor
CO1	**Define** Op-AMP parameters and characteristics.	I	Remembering
CO2	**Select** appropriate analog ICs by reviewing data sheets for industrial and domestic applications	I	Remembering
CO3	**Analyze** the DC and AC amplifier using transistor.	II	Understanding
CO4	**Design**of amplifiers, signal conditioners, filters and oscillators using op-amp circuits.	VI	Creating
CO5	**Build** wave shaping circuits using op-amp.	VI	Creating

CO-PO Mapping:

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

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	50
ESE	50

ISE is based on practical performed/ Quiz/ Lab assignments / Presentation/ Group Discussion/ Internal oral etc.

ESE: Assessment is based on practical and oral examination.

Course Contents:	
Experiment No. 1: **Aim and Objectives:** Measurement of op-amp parameters Using IC 741 a) Input offset voltage b) Input offset current c) slew rate d) CMRR. **Outcomes:** Students will be able to determine op-amp parameters**.** **Theoretical Background:** Students should know parameters of different ICs. **Experimentation:** Experiment is to be performed by using hardware and ICs **Results and Discussions:** NA **Conclusion:**	02 **Hrs.**
Experiment No. 2:--- **Aim and Objectives:** Study ofInverting and Non-Inverting amplifier for DC & AC inputs using IC 741 **Outcomes:** Students will be able todesignInverting amplifier **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**
Experiment No. 3:--- **Aim and Objectives:** Frequency Response of Inverting & Non-Inverting amplifier using IC 741 **Outcomes:** Students will be able toanalyzeFrequency Response of Inverting & Non-Inverting amplifier **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**
Experiment No. 4:--- **Aim and Objectives:** Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non- Inverting Configuration using IC LM 308 **Outcomes:** Students will be able tobuildSumming, Scaling, & Averaging amplifier in Inverting & Non- Inverting Configurationusing op-amp. **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**
Experiment No. 5:--- **Aim and Objectives:** Study of Instrumentation Amplifier using OP 07/LM308 **Outcomes:** Students will be able todesignsignal conditioning usingInstrumentation Amplifier **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**
Experiment No. 6:--- **Aim and Objectives:** Study of V-I & I-V Converter using IC 741 **Outcomes:** Students will be able todemonstrateindustrial applications usingV-I & I-V. Converter **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**
Experiment No. 7:--- **Aim and Objectives:** Study of Schmitt Trigger using IC 324 & Window detector using LM	02 **Hrs.**

311 **Outcomes:** Students will be able todemonstrateSchmitt Trigger**.** **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	
Experiment No. 8:--- **Aim and Objectives:** Study of Comparator & ZCD using LM324 **Outcomes:** Students will be able todemonstrateComparator & ZCD **Theoretical Background:** Basic knowledge of op-amp **Experimentation:** **Results and Discussions:** **Conclusion:**	02 **Hrs.**

Textbooks:

1 Ramakant. A. Gayakwad, "Op-Amps & Linear Integrated Circuits", 3rd Edition, PHI.
2 S.Salivahanan&Bhaaskaran, "Linear Integrated Circuits", 1st Edition, Tata McGraw Hill.

Reference Books:

1. National Analog & Interface products Data book—National Semiconductors
2. Sergio Franco, "Design with op-amp & Analog Integrated Circuits", 3rd Edition, Tata McGraw Hill.
3. K.R.Botkar."Integrated Circuits" Khanna publications, 10th Edition.
4. David. A. John & Ken Martin, "Analog Integrated Circuit Design", Student Edition, Wiley.
5 Roy Choudhary &Shail. B. Jain, "Linear Integrated Circuits",2nd Edition, New Age.

Experiments' Measurable students Learning Outcomes:

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

Title of the Course:Analog Circuit Design LAB	L	T	P	Credit
Course Code:UELN0432	0	0	2	1

Course Pre-Requisite:

Basic knowledge of Multimeter, CRO, active and passive components,

Course Description:

This course is designed to provide students with fundamental concepts to design of ElectronicCircuits for lab experience. By learning this course student enables to design Oscillators and Waveform generators like Multivibrators and Schmitt trigger. This course deals with study operation and design of various types of voltage regulators.

Course Objectives:

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

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Analyze circuits(oscillators, multivibrators, and regulators)as per requirement	IV	Analyzing
CO2	Design circuits(oscillators, multivibrators, and regulators)as per requirement	VI	Creating
CO3	Build circuits(oscillators, multivibrators, and regulators)as per requirement	III	Applying
CO4	Evaluate circuits(oscillators, multivibrators, and regulators)as per requirement	V	Evaluating
CO5	Interpret results of experiment & compare with standard values	V	Evaluating

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	3	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	"-"
CO2	1	2	3	2	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	2
CO3	1	2	3	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	3
CO4	1	1	2	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	3
CO5	1	1	2	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	1

Assessments :

Teacher Assessment:

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

Assessment	Marks
ISE	50
ESE	50

ISE are based on practical performed/ Quiz/ Lab assignments/ Presentation/ Group Discussion/ Internal oral etc.

ESE: Assessment is based on practical and oral examination.

Course Contents:	
Experiment No. 1:--- **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:** Plotted frequency response for single stage common source (CS) amplifier.And observed three different frequency regions of an amplifier.	2**Hrs.**
Experiment No. 2:--- **Aim and Objectives:** To study of RC phase shift oscillator using BJT **Outcomes:** The students will be able to design RC phase shift oscillator using BJT **Theoretical Background:** Theory and operation principle of RC phase shift oscillator using BJT **Experimentation:** Analysis, designing and implementation of RC phase shift oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:** Implemented RC phase shift oscillator using BJT and observed the waveform with designed frequency	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:** To design of colpitt's oscillator using BJT **Outcomes:** The students will be able to design colpitt's oscillator using BJT **Theoretical Background:**Theoryand operation principle of colpitt's oscillator using BJT **Experimentation:** Analysis,designing and implementation of colpitt's oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:** Implemented colpitt's oscillator using BJT and observed the waveform with designed frequency	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:** To design of Hartely oscillator using BJT **Outcomes:** The students will be able to design Hartely oscillator using BJT **Theoretical Background:**Theoryand operation principle of Hartely oscillator using BJT **Experimentation:** Analysis,designing and implementation of Hartely oscillator using BJT **Results and Discussions:** Observed Waveforms **Conclusion:** Implemented Hartely oscillator using BJT and observed the waveform with designed frequency	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives**: Todesign of Astablemultivibrator **Outcomes:**The students will be able to design and evaluate Astablemultivibrator **Theoretical Background:**Theory and operation principle of Astablemultivibrator **Experimentation:** Analysis,designing and implementation of Astablemultivibrator **Results and Discussions:** observed Waveforms **Conclusion:**Implemented Astablemultivibratorand observed waveforms	2**Hrs.**
Experiment No. 6:--- **Aim and Objectives**: Todesign of Monostablemultivibrator **Outcomes:**The students will be able to design and evaluate Monostablemultivibrator **Theoretical Background:**Theory and operation principle of Monostablemultivibrator **Experimentation:** Analysis,designing and implementation of Monostablemultivibrator **Results and Discussions:** observed Waveforms **Conclusion:**Implemented Monostablemultivibratorand observed waveforms	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives**: Todesign of Bistablemultivibrator **Outcomes:**The students will be able to design and evaluate Bistablemultivibrator **Theoretical Background:**Theory and operation principle of Bistablemultivibrator **Experimentation:** Analysis,designing and implementation of Bistablemultivibrator **Results and Discussions:** observed Waveforms	2**Hrs.**

Conclusion: Implemented Bistablemultivibratorand observed waveforms	
Experiment No. 8:--- **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:** Implemented zener shunt voltage regulatorand plotted the graph which indicates regulation action.	2**Hrs.**
Experiment No. 9:--- **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:** Implemented Emitter Follower Voltage Regulator and plotted the graph which indicates regulation action.	2**Hrs.**
Experiment No. 10:--- **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:** Implemented Transistorised Series Voltage Regulator and plotted the graph which indicates regulation action.	2**Hrs.**
Experiment No. 11:--- **Aim and Objectives:** To study of Step up and stepdown SMPS **Outcomes:** The students will be able to explain Step up and stepdown SMPS **Theoretical Background:**Theoryand operation principle of Step up and stepdown SMPS **Experimentation:** Analysis of Step up and stepdown SMPS **Results and Discussions:** comparative understanding of Step up and stepdown SMPS **Conclusion:** Studied Step up and stepdown SMPS	2**Hrs.**

Textbooks:

1. Electronic Devices and circuits by S.Salivahanan,N Suresh Kumar, A Vallavaraj.
2. Electronic Devices and Circuits by Anil K. Maini, Varsha Agarwal- Wiley India.
3. Electronic Devices and Circuits by A.P.Godse and U.A.Bakshi.
4. Electronic Devices and Circuits by Mantri & Jain.

References:

1. Pulse, Digital & Switching Waveforms by Millman, Taub, Rao.
2. Schaum's Outlines, " Electronic Devices and Circuits"
3. Electronic Devices and Circuits by Allen Mottershead-PHI.
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. Solid State Electronic Devices by Ben Streetman, PearsonPublication.

Experiment wise Measurable students Learning Outcomes:

1. The students will be able to design single stage common source (CS) amplifier using FET.
2. The students will be able to design RC phase shift oscillator using BJT
3. The students will be able to design colpitt's oscillator using BJT

4. The students will be able to design Hartelyoscillator using BJT
5. The students will be able to design and evaluate Astablemultivibrator
6. The students will be able to design and evaluate Monostablemultivibrator
7. The students will be able to design and evaluate Bistablemultivibrator
8. The students will be able to test zener shunt voltage regulator
9. The students will be able to test Emitter follower voltage regulator
10. The students will be able to design of transistorized series voltage regulator
11. The students will be able to explain Step up and stepdown SMPS

Title of the Course: Analog Communication LAB Course Code:UELN0433	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite: Knowledge ofsemiconductor devices, working Knowledge of electronic instruments bread boarding, soldering and testing.

Course Description:

This lab is based on constructing and testing analog modulation circuits (AM, FM).Evaluating performance parameters and compare with standard values.

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.

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Construct circuits of Amplitude, frequency modulation and demodulation.	VI	Creating
CO2	Construct circuits of pulse modulation circuits viz. PAM, PPM, PWM, modulation and demodulation.	VI	Creating
CO3	Test and Evaluate different parameters of AM radio receiver.	VI	Creating

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1
CO2	3	2	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO3	2	2	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
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:	
Experiment No. 1:--- **Aim and Objectives:** Study of Amplitude Modulation (A.M.) **Outcomes:** Students should be able toexplain and performAmplitude Modulation concept. **Theoretical Background:**Knowledge of Basicmodulation system **Experimentation:** Students are able toperform experiment based on Amplitude Modulation (A.M.) **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No. 2:--- **Aim and Objectives:** Study of AM Detection. **Outcomes:** Students should be able toexplain and performAM Detection. **Theoretical Background:** Knowledge ofAmplitude Demodulation **Experimentation:** Students are able toperform experiment based on **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No. 3:--- **Aim and Objectives:** Study of AM Receiver Characteristics. (Sensitivity, Selectivity & Fidelity) **Outcomes:** Students should be able toexplain and performAM Receiver Characteristics **Theoretical Background:** Knowledge of radio parameters. **Experimentation:** Students are able toperform experiment based on AM Receiver Characteristics. **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No. 4:--- **Aim and Objectives:** Study of Frequency Modulation. (F.M.) **Outcomes:** Students should be able toexplain and perform Frequency Demodulation**.** **Theoretical Background:** Knowledge ofFrequency Demodulation**.** **Experimentation:**Students should beable toperform experiment based on Frequency Demodulation **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No. 5:--- **Aim and Objectives:** Study of FM Demodulation. **Outcomes:** Students should beable toexplain and perform FM Demodulation**Theoretical Background:** Knowledge ofFM Demodulation. **Experimentation:** Students should beable toperform experiment based onFM Demodulation **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No. 6:---	02 Hrs.

Aim and Objectives: Sampling And Reconstruction. **Outcomes:** Students should beable toexplain and perform SamplingAnd Reconstruction. **Theoretical Background: :** Knowledge of Sampling And Reconstruction. **Experimentation:** Students should beable toperform experiment based on **Results and Discussions:** **Conclusion:**	
Experiment No. 7 :--- **Aim and Objectives:** Study of Pulse Amplitude Modulation (PAM) **Outcomes:** Students should beable toexplain and performPulse Amplitude Modulation (PAM) **Theoretical Background: :** Knowledge of Pulse Amplitude Modulation (PAM) **Experimentation:** Students should beable toperform experiment based on **Results and Discussions:** **Conclusion:**	
Experiment No. 8:--- **Aim and Objectives:** Study of Pulse Width Modulation. (PWM) **Outcomes:** Students should beable toexplain and perform Pulse Width Modulation. (PWM) **Theoretical Background: :** Knowledge of Pulse Width Modulation. (PWM) **Experimentation:** Students should beable toperform experiment based onPulse Width Modulation. (PWM) **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No.9 :--- **Aim and Objectives:** Study of Pulse Position Modulation. (PPM) **Outcomes:** Students should beable toexplain and perform Pulse Position Modulation. (PPM) **Theoretical Background:** Knowledge ofPulse Position Modulation. (PPM) **Experimentation:** Students should beable toperform experiment based onPulse Position Modulation. (PPM) **Results and Discussions:** **Conclusion:**	02 Hrs.
Experiment No.10 :--- **Aim and Objectives:** Study Of Antenna Parameters. **Outcomes:** Students should beable toexplain Antenna Parameters **Theoretical Background:** Knowledge of Antenna. **Experimentation:**Nil **Results and Discussions:** **Conclusion:**	02 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 'IVth 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 Mc Graw Hill Publication
4. B. P. Lathi, Zhi Ding, 'Modern Digital and Analog Communication Systems' 4th edition, Oxford university.
5. Blake, 'Electronics Communication Systems' 2nd edition, cengage Learning.

Experiment wise Measurable students Learning Outcomes: Students should able to

1. Students are able to explain and perform concept of modulation and different types of Modulation.
2. Students are able to explain and perform AM receiver characteristics.
3. Students are able toexplain and perform FM modulation.
4. Students are able to explain and performFM Demodulation.
5. Students are able toexplain and performpulse modulation.
6. Students are able to explain concept antenna parameters.

Title of the Course:Control System Engineering LAB	L	T	P	Credit
Course Code:UELN0434	0	0	2	1

Course Pre-Requisite: Knowledge of Derivative, Integration, Matrices and Laplace transform.

Course Description: The course studies dynamic systems encountered in a variety of instrumentation and Mechatronics systems, the modelling of such systems and the response of these systems to a disturbance. In addition, the control of dynamic systems using feedback and the design of control systems using different design techniques will be studied.

Course Objectives:

Objectives of this course are:

1. To study the fundamental concepts of Control systems and mathematical modeling of the system.
2. To study the concept of time response and frequency response of the system.
3. To study the basics of stability analysis of the system.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Analyze mathematical models of mechanical and electrical systems by their transfer functions using differential equations.	IV	Analyzing
CO2	Analyze time domain and frequency domain systems with response to test inputs.	IV	Analyzing
CO3	Determine the stability of the systems by using Routh's criteria, Nyquist criteria, Bode plot and root locus.	V	Evaluating
CO4	Design of automated system using PLC and PID.	VI	Creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO2	1	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO3	1	2	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	2	"-"
CO4	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO5	2	3	"-"	"-"	2	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	"-"

Assessments :

Teacher Assessment:

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

Assessment	Marks
ISE	50
ESE	50

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

ESE: Assessment is based on oral examination

Course Contents:

A. Hardware Experiment

Experiment No. 1:--- **Aim and Objectives:**Determination of transfer functions of physical system. **Outcomes:**The students will be able towrite differential equation using appropriate laws, apply Laplace transform and take ratio of output to input. **Theoretical Background:**Theoryof mechanical and electrical system **Experimentation:** Any Physical system **Results and Discussions:** Transfer function of physical system **Conclusion:**Transfer function of physical system	2**Hrs.**

Experiment No. 2:--- **Aim and Objectives:**To study time response of first and second order system for a step input. **Outcomes:**The students will be able toplot response of first and second order system for a step input. **Theoretical Background:**Theoryof standard test signals and transfer function. **Experimentation:** Time response of first and second order system. **Results and Discussions:** Observed response and noted analysis Parameters **Conclusion:**Implemented circuit and observed the result	2**Hrs.**
Experiment No. 3:--- **Aim and Objectives:**Verification of Bode plot using Lead Network. **Outcomes:** The students will be able to design and evaluate Lead Network. **Theoretical Background:** Theoryand operation principle of Lead Network. **Experimentation:** Analysis, designing and implementation ofLead Network. **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented Lead Network. and observed the result	2**Hrs.**
Experiment No. 4:--- **Aim and Objectives:**Verification of Bode plot using Lag Network. **Outcomes:** The students will be able to design and evaluate Lag Network. **Theoretical Background:**Theoryand operation principle of Lag Network. **Experimentation:** Analysis,designing and implementation ofLag Network. **Results and Discussions:** observed Waveforms and noted analysis Parameters **Conclusion:**Implemented Lag Network. and observed the result	2**Hrs.**
Experiment No. 5:--- **Aim and Objectives:**To study ON-OFF controller. **Outcomes:** The students will be able to design and evaluateON-OFF controller. **Theoretical Background:**Theoryand operation principle ON-OFF controller. **Experimentation:** Analysis,designing and implementation of ON-OFF controller. **Results and Discussions:** observed and noted analysis Parameters **Conclusion:**observed and noted analysis Parameters	2**Hrs.**
Experiment No. 6:--- **Aim and Objectives:** To Study of PID controller **Outcomes:** The students will be able to design and evaluatePID controller. **Theoretical Background:**Theoryand operation principle of PID controller. **Experimentation:** Designing and implementation of PID controller. **Results and Discussions:** observed response of PID controller noted analysis Parameters **Conclusion:**Implemented PID using PLC setup.	2**Hrs.**
Experiment No. 7:--- **Aim and Objectives:** To Study of PLC. **Outcomes:** The students will be able to study PLC. **Theoretical Background:** Theoryand operation principle of PLC. **Experimentation:** Implementation of different circuits using PLC **Results and Discussions:** Observed response of different circuits using PLC. **Conclusion:** Implemented different circuits using PLC and observed response.	2**Hrs.**
B. Software Experiment Using MATLAB	
Experiment No. 8:--- **Aim and Objectives:**To study time response of first and second order system for a step and ramp input. **Outcomes:**The students will be able toplot response of first and second order system for a step and ramp input. **Theoretical Background:**Theoryof standard test signals and transfer function. **Experimentation:** Time response using MATLAB. **Results and Discussions:** Observed response and noted analysis Parameters **Conclusion:**Implemented using MATLAB.	2**Hrs.**
Experiment No. 9:--- **Aim and Objectives:** To study Bode plot, Nyquist plot and polar plot. **Outcomes:** The students will be able to determine phase margin and gain margin	2**Hrs.**

Theoretical Background: Knowledge of hybrid model for different configurations of transistors. **Experimentation:** Analysis, designing and implementation of plots using MATLAB. **Results and Discussions:** check stability of system. **Conclusion:** Implemented using MATLAB and check stability of system .	
Experiment No. 10:--- **Aim and Objectives:** To study state space analysis **Outcomes:** The students will be able to study MIMO systems. **Theoretical Background:** Theory and operation principle of state,space and variable. **Experimentation:** Analysis, designing and implementation using MATLAB **Results and Discussions:** Noted controllable and observable output. **Conclusion:** Check system is controllable and observable**.**	2**Hrs.**

Textbooks:

1. I.J. Nagrath, M.Gopal "Control Systems Engineering", 5th Edition, New Age International Publication
2. R. Anandanatarajan, P. Ramesh Babu , "Control Systems Engineering", Scitech Publications .
3. A. Ananadkumar, "Control system Engineering" PHI publication 2nd edition.
4.John R. Hackworth,Fredrick D. Hackworth " Programmable Logic Controller" Pearson publication.

References:

1. Norman S. Nise "Control Systems Engineering", 8th edition, Wiley edition.
2. Samarjeet Ghosh, "Control Systems Theory & Applications", 1st edition, Pearson education.
3. S.K. Bhattacharya, "Control Systems Engineering", 1st edition, Pearson education.
4. S. N. Shivanandan,S. N. Deepa," Control System Engineering" Vikas Publications 2nd edition
5.Dhanesh N. Manik" Control Systems" Cengage learning.

Experiment wise Measurable students Learning Outcomes:

2. The students will be able to determine transfer functions of physical system.
2. The students will be able to plot time response of first and second order system for a step input.
3. The students will be able to design and evaluate Bode plot using Lead Network.
4. The students will be able to design and evaluate Bode plot using Lag Network.
5. The students will be able to design and evaluate ON-OFF controller.
6. The students will be able to design and evaluatePID controller.
7. The students will be able to study PLC
8. The students will be able to plot response of first and second order system for a step and ramp input.
9. The students will be able to determine phase margin and gain margin
10. The students will be able to study MIMO systems.

Title of the LAB: Micro project 2 LAB (Digital problem solutions) Course Code: UELN0451	L	T	P	Credit
	0	0	2	1

LAB Pre-Requisite:
Digital Design with VHDL, EDA Tools and architecture of PLDs like CPLD and FPGA,CPLDetc.

LAB Description:
This lab prepares students to develop thinking process to solve Digital design problems by application of science and engineering in innovative manner. The group of students not more than 3 should identify digital design problems, perform requirement analysis. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and objectives of micro-project. As per requirements the group should develop specifications offinal outcomeof 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 and implementation. The group should 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.
This LAB will help to develop sensitivity of students towards digital design problem, think critically to find innovative solutions to simplify human life.
Completed micro project and documentation in the form of micro project report is to be submitted at the end of semester. The project should complete in 12 weeks including field trails if any.
At the end ofproject the guide should advise students to protect IP either in the form of Patent or registration of design or publish paper on work completed or participate in project competition.

The probable areas of the project work (but not only restricted to): Application of digital design for industry, home appliances, sports,agricultute,automotive industry, engineering computations, domestic applications etc.

Course Objectives:
1. Evaluate digital system needs.
2. Identify suitable problem that can be solved using digital design and engineering knowledge and basic knowledge of electronics engineering.
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 will able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Identify social problem that can be implantable usingengineering and skills like, EDA Tools, PLDs and basics of electronics (components soldering and testing using test equipment)	II	Evaluating
CO2	Analyze and build logical/ mathematical/ analyticalmodel of the project.	IV	Analyzing
CO3	Design / simulate the model/ project work	I	Designing
CO4	Implement the project using resources available in the department.	V	Creating
CO5	Developcomprehensive report on project work as per prescribed format	VI	Creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3				2						1		2
CO2	2													2
CO3			3				2							2
CO4					3									2
CO5									2	3				2
CO6								3			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	50
ESE	50

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

ESE: Assessment is based on oral examination

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