Lovely Professional University, Punjab

Course Code	Course Title	Course Planner
ECE131	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	21628::Dr. Suresh Kumar Sudabattula

Course Outcomes : Through this course students should be able to

CO1 :: understand the fundamental behaviour of circuit elements and solve dc networks by different circuit reduction techniques

CO2 :: understand the fundamental behaviour and notations of AC circuits and solve AC circuit problems

CO3 :: discuss the working principles and applications of transformers and motors

CO4 :: analyze the working of various semiconductor devices and its applications

CO5 :: analyze the working of operational amplifiers and filters in electronic devices

CO6 :: analyze the applications of IOT and embedded system in various fields

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	FOUNDATIONS OF ANALOG AND DIGITAL ELECTRONIC CIRCUITS	AGARWAL, ANANT, AND JEFFREY H. LANG.	ELSEVIER

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	FUNDAMENTALS OF ELECTRICAL ENGINEERING AND ELECTRONICS	B.L.THERAJA	S. CHAND & COMPANY
R-2	INTRODUCTION TO ELECTRONICS	EARL GATES	DELMAR - CENGAGE LEARNING
R-3	BASIC ELECTRICAL ENGINEERING	D.C. KULSHRESTHA	MC GRAW HILL
R-4	INTRODUCTION TO EMBEDDED SYSTEMS	K. V. SHIBU	MC GRAW HILL

Other Reading (OR)	
Sr No	**Journals articles as Compulsary reading (specific articles, complete reference)**
OR-1	http://www.csi.uottawa.ca/~rhabash/BIECh12.pdf ,

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| OR-2 | https://www.cedengineering.com/userfiles/Fundamentals%20of%20DC%20Circuits.pdf , | |

Relevant Websites (RW)

Sr No	(Web address) (only if relevant to the course)	Salient Features
RW-1	http://nptel.ac.in/courses/122104013/node7.html	DC circuit analysis
RW-2	http://nptel.ac.in/courses/122104013/node5.html	Sources in circuit
RW-3	http://nptel.ac.in/courses/122104013/node6.html	Types of sources in circuit
RW-4	http://nptel.ac.in/courses/122104013/node8.html	Introduction and usage of dependent sources
RW-5	http://nptel.ac.in/courses/122104013/node11.html	Examples on Norton's and Thevenin's
RW-6	https://www.electrical4u.com/power-in-ac-circuit/	Power in AC circuit
RW-7	https://circuitglobe.com/three-phase-system.html	Three phase circuits introduction
RW-8	https://circuitglobe.com/working-principle-of-a-transformer.html	Working principle of transformer
RW-9	https://www.electrical4u.com/types-of-dc-motor-separately-excited-shunt-series-compound-dc-motor/	Types of DC motors and its applications
RW-10	https://circuitdigest.com/tutorial/induction-motor-working-principle-single-phase-and-three-phase-induction-motor	Working principle of single phase and three phase induction motors
RW-11	https://ocw.nctu.edu.tw/course/digital%20design/Logic%20DesignCh02.pdf	Logic gates introduction
RW-12	https://www.elprocus.com/difference-between-bjt-and-mosfet/	Difference between BJT and MOSFET
RW-13	https://www.allaboutcircuits.com/technical-articles/an-introduction-to-filters/	Introduction to filters
RW-14	http://www2.itif.org/2017-cloud-computing-enables-manufacturing.pdf	Cloud computing for manufacturing processes.
RW-15	https://acodez.in/cyber-physical-systems/#Introduction_to_Cyber-Physical_Systems	Introduction to cyber physical system
RW-16	https://dzone.com/articles/5-sectors-which-use-the-iot-efficiently-but-what-a	Role of IOT in different sectors

Audio Visual Aids (AV)

Sr No	(AV aids) (only if relevant to the course)	Salient Features
AV-1	http://videolectures.net/mit6002s07_agarwal_lec01/	KVL and KCL for circuit analysis
AV-2	http://videolectures.net/mit6002s07_agarwal_lec02/	KVL and KCL
AV-3	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-22	Energy and power
AV-4	http://videolectures.net/mit6002s07_agarwal_lec08/	Dependent sources
AV-5	https://nptel.ac.in/courses/108/108/108108076/	Passive components
AV-6	http://videolectures.net/mit6002s07_agarwal_lec03/	Norton's, Thevenin's and superposition theorems
AV-7	https://www.youtube.com/watch?v=0f7YkVorOmY	Different types of power calculations

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AV-8	https://www.youtube.com/watch?v=WfzPvVdmUho	Power factor explanation
AV-9	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-16/	Steady state analysis
AV-10	https://www.youtube.com/watch?v=Cx4_7lIjoBA	Transformer working
AV-11	http://www.studyelectrical.com/2016/02/video-how-single-phase-induction-motor.html	Induction motor working
AV-12	https://www.youtube.com/watch?v=YwmM_fhNLsQ&vl=en	DC motor classification
AV-13	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-13	Digital circuit
AV-14	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-4	Digital abstraction
AV-15	ttps://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-9-part-1	MOSFET-1
AV-16	ttps://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-9-part-2	MOSFET-2
AV-17	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-5/	Digital Gate
AV-18	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-18/	Filters
AV-19	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-10	Amplifier
AV-20	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-20/	Operational amplifier circuits
AV-21	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuitsand- electronics-spring-2007/video-lectures/lecture-19/	Operational amplifier abstraction
AV-22	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-21/	Op Amps Positive Feedback
AV-23	https://www.youtube.com/watch?v=dcNk0urQsQM	Differences between micro processor and micro controller
AV-24	https://nptel.ac.in/courses/108/102/108102169/	Introduction to embedded system
AV-25	https://www.electropages.com/blog/2019/05/internet-things-and-agriculture-how-iot-revolutionising-agriculture	IOT in agriculture

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

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Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Fundamentals of D.C. circuits(resistance)	T-1 R-2 R-3		Lecture 1: Zero Lecture: Introduction of subject along with its practical relevancy	Students will learn about the practical importance of subject	Lecturing and discussions	Scientific calculator, Laptops, Tablets, Television,Security cameras
	Lecture 2	Fundamentals of D.C. circuits(inductance)	T-1 R-3	RW-6	inductance, capacitance, voltage, current, power and energy concepts, ohm's law	Student will learn about passive components and its calculations and formulae	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	Transformer
		Fundamentals of D.C. circuits(voltage)	T-1 R-3		inductance, capacitance, voltage, current, power and energy concepts, ohm's law	Student will learn about passive components and its calculations and formulae	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	Transformer
		Fundamentals of D.C. circuits(current)	T-1 R-3	AV-7	inductance, capacitance, voltage, current, power and energy concepts, ohm's law	Student will learn about passive components and its calculations and formulae	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	Transformer

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Week 1	Lecture 2	Fundamentals of D.C. circuits(power and energy concepts)	T-1 R-3	RW-1 AV-5	inductance, capacitance, voltage, current, power and energy concepts, ohm's law	Student will learn about passive components and its calculations and formulae	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	Transformer
		Fundamentals of D.C. circuits(ohm's law)	T-1 R-3	AV-3	inductance, capacitance, voltage, current, power and energy concepts, ohm's law	Student will learn about passive components and its calculations and formulae	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	Chokes, Transformer
	Lecture 3	Fundamentals of D.C. circuits(Kirchhoff's laws)	T-1 R-3	AV-1 AV-2	Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule	Student will learn about Kirchhoff's laws, circuit simplification techniques	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(basic method of circuit analysis)	T-1 R-3	AV-1 AV-2	Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule	Student will learn about Kirchhoff's laws, circuit simplification techniques	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	

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Week 1	Lecture 3	Fundamentals of D.C. circuits(intuitive method of circuit analysis- series and parallel simplification)	T-1 R-3		Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule	Student will learn about Kirchhoff's laws, circuit simplification techniques	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(voltage division rule)	T-1 R-3	OR-2	Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule	Student will learn about Kirchhoff's laws, circuit simplification techniques	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(current division rule)	T-1 R-3		Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule	Student will learn about Kirchhoff's laws, circuit simplification techniques	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
Week 2	Lecture 4	Fundamentals of D.C. circuits(star–delta transformation)	T-1 R-3	RW-2 RW-3	star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	

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Week 2	Lecture 4	Fundamentals of D.C. circuits(mesh and nodal analysis)	T-1 R-3	RW-4 AV-4	star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(introduction to dependent and independent sources)	T-1 R-3		star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
	Lecture 5	Fundamentals of D.C. circuits(star–delta transformation)	T-1 R-3	RW-2 RW-3	star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(mesh and nodal analysis)	T-1 R-3	RW-4 AV-4	star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	

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Week 2	Lecture 5	Fundamentals of D.C. circuits(introduction to dependent and independent sources)	T-1 R-3		star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources	Students will learn about star and delta transformation, mesh and nodal analysis for network simplification	Lecturing and discussions. [Chapter 3 (3.3) of reference book D.C. KULSHRESTHA, Chapter 2 (2.1 to 2.2) of text book, Chapter 2 (2.2) of D.C. KULSHRESTHA]	
	Lecture 6	Fundamentals of D.C. circuits(network theorems-superposition theorem)	T-1 R-1 R-2 R-3	RW-5 AV-6	network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(Thevenin's theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(Norton's theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(maximum power transfer theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	

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Week 3	Lecture 7	Fundamentals of D.C. circuits(network theorems-superposition theorem)	T-1 R-1 R-2 R-3	RW-5 AV-6	network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(Thevenin's theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(Norton's theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
		Fundamentals of D.C. circuits(maximum power transfer theorem)	T-1 R-1 R-2 R-3		network theorems-superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	Student will learn about the procedure for calculating theorems on independent sources only	Lecturing and discussions. [Chapter 3 (3.1,3.2,3.3,3.4,3.5) of text book, Chapter 4(4.5) of reference book D.C. KULSHRESTHA]	
	Lecture 8	Fundamentals of A.C. circuits(alternating current and voltage)	T-1 R-1 R-3	OR-1	alternating current and voltage, concept of notations (i, v, I, V)	Student will learn about difference between DC and AC voltage and different types of notations	Lecturing,questioning and demonstration.	Resistive load, inductive load and capacitive load in daily life.
		Fundamentals of A.C. circuits(concept of notations (i, v, I, V))	T-1 R-1 R-3		alternating current and voltage, concept of notations (i, v, I, V)	Student will learn about difference between DC and AC voltage and different types of notations	Lecturing,questioning and demonstration.	Resistive load, inductive load and capacitive load in daily life.

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Week 3	Lecture 9	Fundamentals of A.C. circuits(definitions of amplitude)	R-1 R-3		definitions of amplitude, phase, phase difference, RMS value and average value of an AC signal	Student will learn about basic definitions of RMS value, average value , frequency and its waveform representation	Lecturing,questioning and demonstration.	supply power to houses, buildings, office, etc.
		Fundamentals of A.C. circuits(phase)	R-1 R-3		definitions of amplitude, phase, phase difference, RMS value and average value of an AC signal	Student will learn about basic definitions of RMS value, average value , frequency and its waveform representation	Lecturing,questioning and demonstration.	supply power to houses, buildings, office, etc.
		Fundamentals of A.C. circuits(phase difference)	R-1 R-3		definitions of amplitude, phase, phase difference, RMS value and average value of an AC signal	Student will learn about basic definitions of RMS value, average value , frequency and its waveform representation	Lecturing,questioning and demonstration.	supply power to houses, buildings, office, etc.
		Fundamentals of A.C. circuits(RMS value and average value of an AC signal)	R-1 R-3		definitions of amplitude, phase, phase difference, RMS value and average value of an AC signal	Student will learn about basic definitions of RMS value, average value , frequency and its waveform representation	Lecturing,questioning and demonstration.	supply power to houses, buildings, office, etc.
Week 4	Lecture 10	Fundamentals of A.C. circuits(complex representation of impedance)	T-1 R-1	AV-9	complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	
		Fundamentals of A.C. circuits(steady state analysis of ac circuits consisting of RL, RC and RLC (series))	T-1 R-1		complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	
		Fundamentals of A.C. circuits(resonance in series RLC circuit)	T-1 R-1		complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	

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Week 4	Lecture 11	Fundamentals of A.C. circuits(complex representation of impedance)	T-1 R-1	AV-9	complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	
		Fundamentals of A.C. circuits(steady state analysis of ac circuits consisting of RL, RC and RLC (series))	T-1 R-1		complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	
		Fundamentals of A.C. circuits(resonance in series RLC circuit)	T-1 R-1		complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series)	Student able to learn about how represent impedance in complex form, steady state analysis of different of circuits	Lecturing and discussions. [Chapter 13 (13.3.1,13.3.2,13.4.1,13.7),Chapter 14 (14.3) of text book]	
	Lecture 12	Fundamentals of A.C. circuits(power factor and power calculation in RL, RC and RLC circuits)	R-3	AV-8	power factor and power calculation in RL, RC and RLC circuits	Student will learn about different types of power calculations	Lecturing and discussions. [Chapter 9 (9.6) of reference book D.C. KULSHRESTHA]	
Week 5	Lecture 13	Fundamentals of A.C. circuits(power factor and power calculation in RL, RC and RLC circuits)	R-3	AV-8	power factor and power calculation in RL, RC and RLC circuits	Student will learn about different types of power calculations	Lecturing and discussions. [Chapter 9 (9.6) of reference book D.C. KULSHRESTHA]	
	Lecture 14	Fundamentals of A.C. circuits(three-phase circuits-numbering and interconnection (delta or mesh connection) of three phases, relations in line and phase voltages and currents in star and delta)	R-1 R-3	RW-7	three-phase circuits-numbering and interconnection (delta or mesh connection) of three phases, relations in line and phase voltages and currents in star and delta	Students will learn about the fundamentals of three-phase circuitsnumbering and interconnection(delta or mesh connection) of three phases, relations in line and phase voltages and currents in star and delta.	Lecturing,questioning and demonstration	Three phase motors,generators,transformers etc.
	Lecture 15				Online Assignment			

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Week 6	Lecture 16	Fundamentals of electrical machines(Fleming's left hand and right hand rule)	R-1 R-3		Fleming's left hand and right hand rule	Students will learn about the basics of mutual inductance and mutual coupling, Fleming's left hand and right hand rule	Lecturing,questioning and demonstration	Transformer,machines etc.
	Lecture 17	Fundamentals of electrical machines(mutual inductance and mutual coupling phenomena in transformer)	R-1 R-3		Fundamentals of Transformer and instrument transformer	Students will learn about the fundamentals of Transformer and instrument transformer	Lecturing and discussions. [Chapter 13 (13.1,13.2,13.3,13.10.13.11,13.13) of reference book D.C. KULSHRESTHA]	
		Fundamentals of electrical machines(transformer – working, concept of turns ratio and applications)	R-1 R-3	RW-8 AV-10	Fundamentals of Transformer and instrument transformer	Students will learn about the fundamentals of Transformer and instrument transformer	Lecturing and discussions. [Chapter 13 (13.1,13.2,13.3,13.10.13.11,13.13) of reference book D.C. KULSHRESTHA]	
		Fundamentals of electrical machines(transformer on DC)	R-1 R-3		Fundamentals of Transformer and instrument transformer	Students will learn about the fundamentals of Transformer and instrument transformer	Lecturing and discussions. [Chapter 13 (13.1,13.2,13.3,13.10.13.11,13.13) of reference book D.C. KULSHRESTHA]	
		Fundamentals of electrical machines(instrument transformers)	R-1 R-3		Fundamentals of Transformer and instrument transformer	Students will learn about the fundamentals of Transformer and instrument transformer	Lecturing and discussions. [Chapter 13 (13.1,13.2,13.3,13.10.13.11,13.13) of reference book D.C. KULSHRESTHA]	
	Lecture 18	Fundamentals of electrical machines(auto-transformer)	R-3	RW-9 AV-12	auto-transformer, dc machines- working principles, classification, starting, speed control and applications of dc motors	Students will learn the fundamentals of dc machinesworking principles, classification, starting, speed control and applications of dc motors.	Lecturing,questioning and demonstration. [Chapter 16(16.1,16.2,16.6,16.8,16.11,16.14) of reference book D.C. KULSHRESTHA	Cranes,lathe machines,motors used in conveyor belts etc.

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Week	Lecture	Topic						
Week 6	Lecture 18	Fundamentals of electrical machines(dc machines- working principles, classification, starting, speed control and applications of dc motors)	R-3		auto-transformer, dc machines- working principles, classification, starting, speed control and applications of dc motors	Students will learn the fundamentals of dc machinesworking principles, classification, starting, speed control and applications of dc motors.	Lecturing,questioning and demonstration. [Chapter 16(16.1,16.2,16.6,16.8 ,16.11,16.14) of reference book D.C. KULSHRESTHA	Cranes,lathe machines,motors used in conveyor belts etc.
Week 7	Lecture 19	Fundamentals of electrical machines(working principle of single and three phase induction motors)	R-3	RW-10 AV-11	working principle of single and three phase induction motors, applications of ac motors	Students will learn about the fundamentals of Induction motor along with its application.	Lecturing and discussions. [Chapter 15(15.1,15.2) of reference book D.C. KULSHRESTHA]	Motors used in industries and ceiling fan.
		Fundamentals of electrical machines(applications of ac motors)	R-3		working principle of single and three phase induction motors, applications of ac motors	Students will learn about the fundamentals of Induction motor along with its application.	Lecturing and discussions. [Chapter 15(15.1,15.2) of reference book D.C. KULSHRESTHA]	Motors used in industries and ceiling fan.

SPILL OVER

Week	Lecture							
Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			

MID-TERM

Week	Lecture	Topic						
Week 8	Lecture 22	Fundamentals of semiconductor devices and digital circuits(digital abstraction- voltage levels and the static discipline)	T-1	RW-11 AV-13 AV-14 AV-17	Fundamentals of digital abstraction- voltage levels and the static discipline, boolean logic, combinational gates.	Students will learn about the fundamentals of digital abstractionvoltage levels and the static discipline, boolean logic, combinational gates.	Lecturing and discussions. [Chapter 14(14.5.1,14.5.2,14.5. 3) of text book]	
		Fundamentals of semiconductor devices and digital circuits(boolean logic)	T-1		Fundamentals of digital abstraction- voltage levels and the static discipline, boolean logic, combinational gates.	Students will learn about the fundamentals of digital abstractionvoltage levels and the static discipline, boolean logic, combinational gates.	Lecturing and discussions. [Chapter 14(14.5.1,14.5.2,14.5. 3) of text book]	

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Week 8	Lecture 22	Fundamentals of semiconductor devices and digital circuits (combinational gates)	T-1		Fundamentals of digital abstraction- voltage levels and the static discipline, boolean logic, combinational gates.	Students will learn about the fundamentals of digital abstractionvoltage levels and the static discipline, boolean logic, combinational gates.	Lecturing and discussions. [Chapter 14(14.5.1,14.5.2,14.5.3) of text book]	
	Lecture 23	Fundamentals of semiconductor devices and digital circuits(fan-in and fan-out of gates)	T-1		Fan-in and fan-out of gates, noise margin in details.	Students will learn aboutfan-in and fanout of gates, noise margin in details	Lecturing and discussions.	
		Fundamentals of semiconductor devices and digital circuits(noise margin in details)	T-1		Fan-in and fan-out of gates, noise margin in details.	Students will learn aboutfan-in and fanout of gates, noise margin in details	Lecturing and discussions.	
	Lecture 24	Fundamentals of semiconductor devices and digital circuits(pn junction and zener diode characteristics and analysis)	T-1 R-2		pn junction and zener diode characteristics and analysis	Students will learn about semiconductor diode characteristics, analysis of diode circuits	Lecturing and discussions. [Chapter 16(16.1,16.2,16.3,16.4.2) of text book,Chapter 20(20.5) of reference book Earl D. Gates]	
Week 9	Lecture 25	Fundamentals of semiconductor devices and digital circuits(testing of diodes and its applications)	T-1 R-2	RW-12	testing of diodes and its applications, basic operation and testing of BJT	Student will learn about applications of diodes, basic operation and testing of BJT	Lecturing and discussions. [Chapter 16(16.1,16.2,16.3,16.4.2) of text book,Chapter 20(20.5) of reference book Earl D. Gates], Lecturing,questioning and demonstration. [Chapter 22(22.3,22.4) of reference book EARL GATES]	

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Week	Lecture							
Week 9	Lecture 25	Fundamentals of semiconductor devices and digital circuits(basic operation and testing of BJT)	T-1 R-2		testing of diodes and its applications, basic operation and testing of BJT	Student will learn about applications of diodes, basic operation and testing of BJT	Lecturing and discussions. [Chapter 16(16.1,16.2,16.3,16.4.2) of text book,Chapter 20(20.5) of reference book Earl D. Gates], Lecturing,questioning and demonstration. [Chapter 22(22.3,22.4) of reference book EARL GATES]	
	Lecture 26	Fundamentals of semiconductor devices and digital circuits(MOSFET representation and its characteristics)	T-1	RW-12 AV-15 AV-16	MOSFET representation and its characteristics	Students will learn the basics MOSFET representation and characteristics.	Lecturing and discussions. [Chapter 7 (7.3),Chapter 6(6.3) of text book	
	Lecture 27	Fundamentals of semiconductor devices and digital circuits(handling of integrated circuits-ESD phenomena)	R-2		handling of integrated circuits-ESD phenomena	Students will learn the basics of ESD affect in IC.	Lecturing and discussions. [Chapter 25 (25.4) of reference book EARL GATES]	
Week 10	Lecture 28				Online Assignment			
	Lecture 29	Fundamentals of filters and operational amplifier(filter examples- band-pass filter, low-pass filter, high-pass filter)	T-1	RW-13 AV-18	Band-pass filter, lowpass filter, high-pass filter	Students will learn about band-pass filter, low-pass filter, high-pass filter.	Lecturing and discussions. [Chapter 14(14.5.1,14.5.2,14.5.3) of text book]	
	Lecture 30	Fundamentals of filters and operational amplifier (operational amplifier abstraction- device properties of the operational amplifier)	T-1		operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2,15.6.1,15.6.2) of text book]	
		Fundamentals of filters and operational amplifier(simple op amp circuits – virtual ground concept, inverting and non-inverting op-amp)	T-1	AV-19 AV-20 AV-21 AV-22	operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2,15.6.1,15.6.2) of text book]	

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Week	Lecture						
Week 10	Lecture 30	Fundamentals of filters and operational amplifier(op-amp as an adder and subtractor)	T-1		operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2, 15.6.1,15.6.2) of text book]	
Week 11	Lecture 31	Fundamentals of filters and operational amplifier (operational amplifier abstraction- device properties of the operational amplifier)	T-1		operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2, 15.6.1,15.6.2) of text book]	
		Fundamentals of filters and operational amplifier(simple op amp circuits – virtual ground concept, inverting and non-inverting op-amp)	T-1	AV-19 AV-20 AV-21 AV-22	operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2, 15.6.1,15.6.2) of text book]	
		Fundamentals of filters and operational amplifier(op-amp as an adder and subtractor)	T-1		operational amplifier abstraction- device properties of the operational amplifier	Student will learn about properties of operation amplifier	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2, 15.6.1,15.6.2) of text book]	
	Lecture 32	Fundamentals of filters and operational amplifier(op-amp RC circuits – op-amp integrator, op-amp differentiator)	T-1		op-amp RC circuits – op-amp integrator, op-amp differentiator	Student will learn about how op-amp acts as a differenciator and integrator	Lecturing and discussions. [Chapter 15(15.3,15.5.1,15.5.2, 15.6.1,15.6.2) of text book]	
	Lecture 33	Fundamentals of filters and operational amplifier(op-amp as a comparator and its application in anti-lock braking systems)	T-1		p-amp as a comparator and its application in anti-lock braking systems	Students will learn about theop-amp as a comparator and its application in antilock braking .	Lecturing and discussions	
Week 12	Lecture 34	Fundamentals of embedded system and its application in industrial processes (comparison of microprocessor and micro-controller)	R-4	AV-23	comparison of microprocessor and micro-controller, introduction to embedded system	Students will learn about the basics of embedded system,microprocessor and microcontroller and types of processors.	Lecturing and discussions. [Chapter 2(2.1.1.4) of reference book K. V. SHIBU]	

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Week 12	Lecture 34	Fundamentals of embedded system and its application in industrial processes (introduction to embedded system)	R-4	AV-24	comparison of microprocessor and micro-controller, introduction to embedded system	Students will learn about the basics of embedded system,microprocessor and microcontroller and types of processors.	Lecturing and discussions. [Chapter 2(2.1.1.4) of reference book K. V. SHIBU]	
	Lecture 35	Fundamentals of embedded system and its application in industrial processes(types of processors : SOC, ASIC, DSP and FPGA)	R-4		Types of processors : SOC, ASIC, DSP and FPGA	Student will learn about types of processors	Lecturing and discussions. [Chapter 1(1.4.1),Chapter 16(16.1.1),Chapter 2(2.1.2,2.1.3, of reference book K. V. SHIBU]	computers, laptops, and smartphones
	Lecture 36	Fundamentals of embedded system and its application in industrial processes (examples of real-time applications of embedded system : GPOS and RTOS)	R-4		basics of embedded system, examples of real-time applications of embedded system : GPOS and RTOS	Student will learn about types of processors and basics of embedded system	Lecturing and discussions. [Chapter 1(1.1,1.2,1.3,1.4,1.5, 1.6),Chapter 10(10.1,10.2) of reference book K. V. SHIBU]	Laptops and computers
Week 13	Lecture 37	Fundamentals of embedded system and its application in industrial processes(cyber physical world)	T-1	RW-15	Cyber physical world	Students will have insight about the cyber physical world	Lecturing and discussions	
	Lecture 38	Fundamentals of embedded system and its application in industrial processes(role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid)	R-4	RW-14 RW-16 AV-25 DK-1	role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid	Students will learn about the role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid	Lecturing and discussions. [Chapter 16(16.7) of reference book K. V. SHIBU]	

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Week 13	Lecture 39	Fundamentals of embedded system and its application in industrial processes(role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid)	R-4	RW-14 RW-16 AV-25 DK-1	role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid	Students will learn about the role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid	Lecturing and discussions. [Chapter 16(16.7) of reference book K. V. SHIBU]	
Week 14	Lecture 40				Online Assignment			
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	DC circuits	Problem Solving,Doubt Clearance
Tutorial2	DC circuits	Problem Solving,Doubt Clearance
Tutorial3	DC circuits	Problem Solving,Doubt Clearance
Tutorial4	AC circuits	Problem Solving,Doubt Clearance
Tutorial5	AC circuits	Problem Solving,Doubt Clearance
Tutorial6	Transformers, DC Machines and AC Machines	Problem Solving,Doubt Clearance
Tutorial7	Transformers, DC Machines and AC Machines	Problem Solving,Problem Solving, Doubt Clearance
After Mid-Term		
Tutorial8	Semiconductor devices	Doubt Clearance
Tutorial9	Semiconductor devices	Doubt Clearance
Tutorial10	Operational amplifier and its working in inverting and non-inverting mode	Problem Solving,Doubt Clearance
Tutorial11	Operational amplifier	Problem Solving,Doubt Clearance

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Tutorial12	Op-amp as filter and applications	Doubt Clearance
Tutorial13	Embedded system hardware, embedded system software, real-time embedded systems, role of embedded systems in industrial automation	Doubt Clearance
Tutorial14	Real-time applications of embedded system,monitoring and control of industrial processes, IOT applications	Doubt Clearance