AMRITA VISHWA VIDYAPEETHAM

Amrita School of Engineering, Chennai

Course Delivery Plan

Name of the Course / Code	Basic Electrical and Electronics Engineering /19EEE100	Department	Electrical and Electronics Engineering
Credit	3	Semester / Year	I/I
Name of the Faculty	Dr. Nikhil Kumar C S – Ph.D. IIT Madras Dr. Laksman S A – Ph.D. IIT Mandi	Pre-requisite	Kirchoff's current law, Kirchhoff voltage law, Transients and Steady State, Fleming's thump rule
Designation / Dept	19EEE1000 (ECE & CCE)	**Academic Year**	**2020-2021**
Course Overview	**This course tells you about the fundamental concepts of electrical engineering such as voltage, current, circuit elements, theorems, single-phase, three phase circuits and electrical machines. Basics of electronics electronis circuits such as diode and operational amplifier.**		

Course Objective		Course Outcome		BTL	Weightage of BTL
1	To impart basic knowledge of electrical quantities and provide working knowledge for the analysis of DC and AC circuits	**CO 1**	Understand the basic electric and magnetic circuits	**2**	**0.2**
2	To understand the construction and working principle of DC and AC machines.	**CO 2**	Analyse DC and AC circuits	**4**	**0.3**
3	To facilitate understanding of basic electronics and operational amplifier circuits	**CO 3**	Interpret the construction and working of different types of electrical machines	**3**	**0.3**
		CO 4	Analyse basic electronic components and circuits	**4**	**0.2**

	Course BT Level	3.3

Course Syllabus

Unit 1

Introduction to Electrical Engineering, Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Energy and Power – Series parallel combination of R, L, C components, Voltage Divider and Current Divider Rules – Super position Theorem, Network Analysis – Mesh and Node methods- Faraday's Laws of Electro-magnetic Induction, Magnetic Circuits, Self and Mutual Inductance, Generation of sinusoidal voltage, Instantaneous, Average and effective values of periodic functions, Phasor representation. Introduction to 3-phase systems, Introduction to electric grids.

Unit 2

Electrical Machines: DC Motor: Construction, principle of operation, Different types of DC motors, Voltage equation of a motor, significance of back EMF, Speed, Torque, Torque-Speed characteristics, Output Power, Efficiency and applications. Single Phase Transformer: Construction, principle of operation, EMF Equation. Regulation and Efficiency of a Transformer. Induction Machine: Three Phase Induction Motor: Construction and Principle of Operation, Slip and Torque, Speed Characteristics. Stepper motor: Construction, principle and mode of operation.

Unit 3

PN Junction diodes, VI Characteristics, Rectifiers: Half wave, Full wave, Bridge. Zener Diode- characteristics, Optoelectronic devices. BJT – characteristics and configurations, Transistor as a Switch. Junction Field Effect Transistors - operation and characteristics, Thyristor – Operation and characteristics. Fundamentals of DIAC and TRIAC.555 Timer, Integrated circuits.Operational Amplifiers – Inverting and Non-inverting amplifier – Instrumentation amplifiers.

Textbooks / Reference

Text Books

Edward Hughes. "Electrical and Electronic Technology", 10th Edition, Pearson Education Asia, 2019.

D. P. Kothari, I J Nagrath, "Electric Machines", 5th Edition, Tata McGraw Hill, 2017.

A. P. Malvino, "Electronic Principles", 7th Edition, Tata McGraw Hill, 2007.

References

S. K. Bhattcharya, "Basic Electrical and Electronics Engineering", Pearson, 2012.

Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall of India Private Limited, 2nd Edition, 2003.

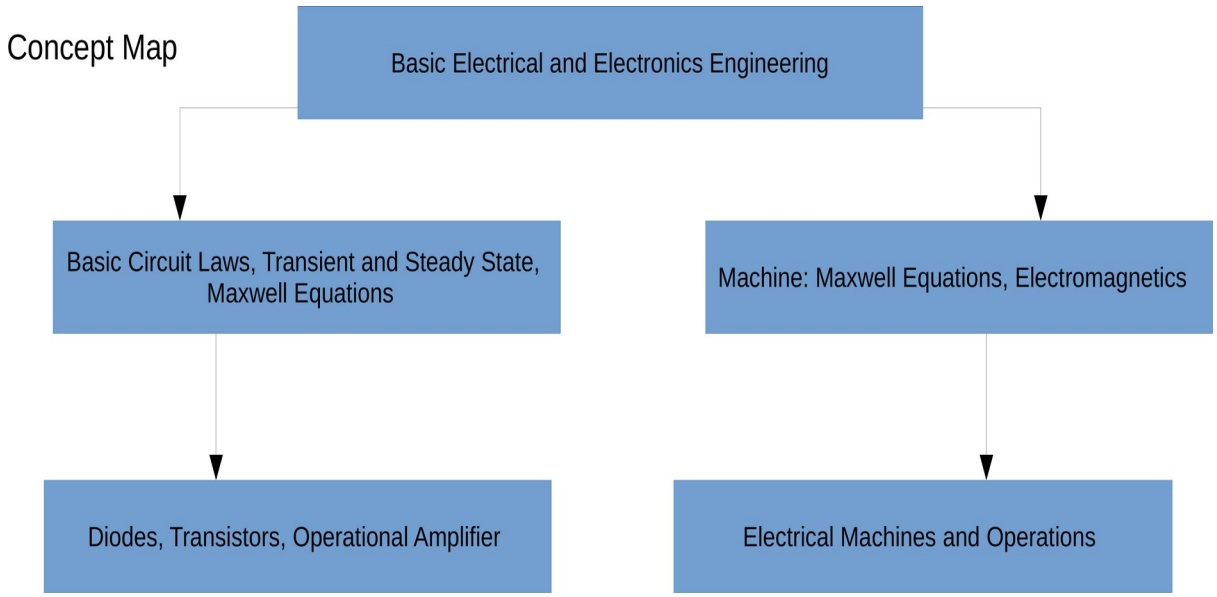
David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

Michael Tooley B. A., "Electronic circuits: Fundamentals and Applications", 3rd Edition, Elsevier Limited, 2006

K. S Suresh Kumar, "Electric Circuits and Networks" acommon book for electrical and electronics. This book deals with basic fundamentals in Electrical, Electronics,

Electromagnetics**.** Will get the ability to crack central government interviews.
W.H. Hayt, "Engineering Circuit Analysis" Mcgraw Hill, 2012- Problem solving skills through this book. Will get the ability to crack central government exams.

Concept Map



Evaluation and Grading

Internal			**External**	**Total**
Components	**Weightage**		**Examination conducted for 50 Marks (90 minutes.) Viva Voce**	**Internal + External = 100 %**
First Test (Online)	10%	30 %		
Second Test (Online)	10%			
Third Test (Online)	10%			
Continuous Assessment	**Weightage**			
Quiz	10%			
Problem based Assignment	20%			

Seminar & Capstone Project	10%	40 %	**Weightage 30%**	

Programme Outcome (PO)	
PO 1	**Engineering knowledge** : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis** : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions** : Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. set
PO 4	**Conduct investigations of complex problems** : Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage** : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society** : Apply reasoning informed by the contextual knowledge to Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability** : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
PO 8	**Ethics** : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work** : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication** : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions..
PO 11	**Project management and finance** : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning** : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO 1	**Awareness of Future Technology**: Develop solutions for future systems using smart technologies.

PSO 2	**Research and Innovation**: Investigate new problems from fundamental knowledge

CO – PO Affinity Map

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO 3
CO 1	3	3													
CO 2	3	3		1											
CO 3	3	3													
CO 4	3	3	3	2		1									

3 – Strong, 2 Moderate, 1 -weak

Lecture Plan

Class	Topics to be covered	Mode of Teaching	In-Class Activities	Out- Class Student Activities (E – References)	CO Mapping	Reference
1	Introduction to Electrical Engineering, Current and Voltage sources	Microsoft Teams	Basic understanding of voltage and current		CO	TB1
2	Resistance, Inductance and Capacitance	Microsoft Teams	Explanation of circuit elements	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO1	TB1
3	Ohm's law, law, Energy and Power	Microsoft Teams	Ohm's law, power and energy-Problems. (Quiz)	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO1	TB1
4	Kirchhoff's Law KCL and KVL Problems	Microsoft Teams	KCL, KVL-Problems	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO1	TB1
6	Series parallel combination of R, L, C components	Microsoft Teams	Series and parallel circuits-problems	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search the keywords	CO1	TB1
7	Voltage Divider and Current Divider Rules	Microsoft Teams	VDR and CDR-problems Circuit based learning (Quiz-I)	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO2	TB1
8	Super position Theorem	Microsoft Teams	Importance of super position theorem-problems Simulation based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO2	TB1, TB2, RBI
9	Network Analysis – Mesh and Node	Microsoft	Mesh and Node analysis	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO2	TB1, TB2, RBI

	methods	Teams				
10	Mesh and Node methods	Microsoft Teams	Understanding of Mesh and Node analysis-Problems Circuit based learning (Quiz)	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance Search thekeywords	CO2	TB, TB2, RBI
11	AC analysis of RLC circuits	Microsoft Teams	Difference between DC and AC circuits Analysis of AC circuits	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-17/ Search thekeywords	CO2	TB1, TB2, RBI
12	AC Circuit Analysis Mesh and super mesh	Microsoft Teams	Mesh analysis with AC source - Problems	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-17/ Search thekeywords	CO2	TB1, TB2, RBI
13	AC Circuit Analysis node and node mesh	Microsoft Teams	Mesh analysis with AC source- Problems (Assignment-I)	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-17/ Search thekeywords	CO2	TB2
14	Faraday's Laws of Electro-magnetic Induction	Microsoft Teams	Basics of faradays law electromagnetic induction Circuit based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Resistance%2C%20Inductance%20and%20Capacitance	CO1	TB2
15	Magnetic Circuits - Self and Mutual Inductance	Microsoft Teams	Discussion on self and mutual inductance	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-17/ Search thekeywords	CO1	TB2
16	Generation of sinusoidal voltage	Microsoft Teams	Discussion on AC source Simulation based learning	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-16/ Search thekeywords	CO2	TB2
17	Instantaneous, Average and effective values of periodic functions -	Microsoft Teams	Discussion on AC source-Average, RMS values (Quiz)	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-16/ Search thekeywords	CO2	TB2

18	Phasor representation	Microsoft Teams	Introduction to phasor	h https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-16/ Search keywords	CO2	TB2
19	Introduction to 3-phase systems	Microsoft Teams	Importance of 3-phase System Simulation based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Integrated%20circuits%20Operational%20Amplifiers%20 Search keywords	CO2	TB2
20	Introduction to electric grids	Microsoft Teams	Basic understanding of electrical grid (Assignment-II)	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-061-introduction-to-electric-power-systems-spring-2011/	CO2	TB2
21	**First Test-I**					
22	Electrical Machines: DC Motor: Construction, principle of operation	Microsoft Teams	Introduction to Generators and motors Circuit based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
23	Different types of DC motors, Voltage equation of a motor, significance of back EMF, Speed, Torque, Torque-Speed characteristics	Microsoft Teams	Characteristics of DC Motor Circuit based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
24	Output Power, Efficiency and applications	Microsoft Teams	Efficiency calculation (Quiz)	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
25	Single Phase Transformer:	Microsoft	Basics of transformer	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20	CO3	TB2

	Construction, principle of operation	Teams		Search keywords		
26	EMF Equation.	Microsoft Teams	Derivation of EMF equation	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
27	Regulation and Efficiency of a Transformer	Microsoft Teams	Efficiency calculation of Transformer (Assignment-III)	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
28	Induction Machine: Three Phase Induction Motor	Microsoft Teams	Basic principle of Induction machine	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
29	Construction and Principle of Operation,	Microsoft Teams	Discussion on operation of Induction motors Simulation based learning	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
30	Slip and Torque, Speed Characteristics.	Microsoft Teams	Characteristics of Induction motor	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
31	Stepper motor: Construction, principle and mode of operation.	Microsoft Teams	Basic working principle of stepper motor (Assignment-IV)	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO3	TB2
32	**Second Test**	Microsoft Teams				
33	PN Junction diodes, VI Characteristics	Microsoft	Characteristics of diode	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20	CO4	TB1

		Teams		Search keywords		
34	Rectifiers: Half wave, Full wave Bridge	Microsoft Teams	Rectifier operation	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
35	Zener Diode-characteristics Optoelectronic devices.	Microsoft Teams	Basics of voltage regulator (Quiz)	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
36	BJT – characteristics and configurations, transistor as a Switch	Microsoft Teams	Working principle of Transistor	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
37	Field Effect Transistors - operation and characteristics	Microsoft Teams	Working principle of FET (Assignment-V)	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
38	Thyristor – Operation and characteristics	Microsoft Teams	Thyristor basics	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
39	Fundamentals of DIAC and TRIAC.555 Timer	Microsoft Teams	Introduction to DIAC and TRIAC	https://ocw.mit.edu/search/ocwsearch.htm?q=Electrical%20Machines%3A%20DC%20Motor%3A%20Construction%2C%20principle%20of%20operation%20 Search keywords	CO4	TB1
40	Integrated circuits Operational Amplifiers	Microsoft Teams	Basics of Op-Amp	https://ocw.mit.edu/search/ocwsearch.htm?q=Integrated%20circuits%20Operational%20Amplifiers%20	CO4	TB1
41	Inverting and Non-inverting amplifier –	Microsoft Teams	Inv and Non-inv amp	https://ocw.mit.edu/search/ocwsearch.htm?q=Integrated%20circuits%20Operational%20Amplifiers%20 Search keywords	CO4	TB1
42	Instrumentation amplifiers.	Microsoft	Basics of Inst. Amp (Assignment-VI)	https://ocw.mit.edu/search/ocwsearch.htm?q=Integrated%20circuits%20Operational%20Amplifiers%20	CO4	TB1

		Teams		Search keywords		
43	Revision on Unit-I	Microsoft Teams	Solving Problems			
44	Revision on Unit-II	Microsoft Teams	Solving Problems			
45	Revision on Unit-III	Microsoft Teams	Discussing Concepts			
46	**Third Test**					

BTL Mapping						
UNIT	**Major Topics**	**Skill Set**	**CO**	**BTL**	**Weightage ***	**Weightage BTL****
1	Ohm's law, Kirchhoff's law, Energy and Power,. Faraday's Laws of Electro-magnetic Induction, Self and Mutual Inductance	Ability to analyze voltage, current and circuit analysis	1	2	0.5	3
	Mesh and Node voltage analysis, Network Theorems	Ability to analyze network theorems and circuit elements	2	4	0.25	

	Introduction to AC system and 1-phase and 3-phaase systems, Introduction to electric grids.	Ability to analysis various types of AC circuits	2	4	0.25	
2	DC machines-Generators, motors-Working principle and characteristics	Ability to understand the principles of DC machines	3	3	0.5	3
	Transformers-EMF equation, Regulation and efficiency of a transformer. Induction machine-working operation-Characteristics	Ability to understand the working operation of Transformers and the characteristics of 3-phase Induction machine	3	3	0.5	
3	Diode-Characteristics, Voltage regulator	Ability to analysis various types of semiconductor devices	4	4	0.5	4
	BJT-FET-Operation and characteristics, Operating principle of Operational Amplifiers	Ability to apply BJT devices for specific applications and various types of Operational Amplifiers	4	4	0.5	
					Course BTL Level	**3.3**

Faculty **Course Mentor** **Academic Incharge** **Principal**

Questions for Student Survey on Learning Outcomes

(Upon completing the module, I am able to:)

CO. No	Questions	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
CO1	Have you learned the fundamental network analysis andobtained the skills to solve circuit problem?.					
CO2	Have you learned the basics of Electric Motors and obtained the skills to solve Electric Machine problems using equivalent circuit representation?.					
CO3	Have you learned to solve electronic circuits using equivalent representation?					
CO4						
CO5						