

COURSE CODE: 1154EE117	COURSE TITLE: COMPUTER AIDED ANALYSIS OF ELECTRICAL APPARATUS	L	T	P	C
		2	0	2	3
COURSE CATEGORY:					
University Elective					
PREAMBLE:					
This course will provide in depth knowledge on DC & AC machines concepts by theoretically reading and practically simulating.					
PREREQUISITE COURSES:					
Basic Electrical Engineering					
RELATED COURSES:					
Electrical Machine Design					
COURSE EDUCATIONAL OBJECTIVES:					
<p>To impart knowledge on</p> <ul style="list-style-type: none"> To provide knowledge on purpose and procedure of Finite Element Analysis method To educate the design, mesh creation and types of solvers in MagNet software by practical simulation To provide knowledge on DC machine construction, working principle and DC series motor design using MagNet simulation software To educate the operation of transformer by theoretical, design of core and shell type transformer using MagNet simulation software To educate the concept of three phase Induction machines and design of squirrel cage induction motor using MagNet simulation software 					
COURSE OUTCOMES :					
Upon the successful completion of the course, students will be able to:					
CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)			
CO1	Explain the purpose of FEA and types of Finite Elements	K2			
CO2	Show the model of object, elements in 1D,2D,3D and types of solvers using MagNet software	K3			
CO3	Explain the concept, types of DC machine and show the simulation of DC series motor using MagNet software	K3			
CO4	Explain the principle, types of transformer and show the simulation of core, shell type transformer using MagNet software	K3			
CO5	Explain the principle, types of DC machine and show the simulation of Squirrel cage induction motor using MagNet software	K3			

CORRELATION OF COs AND POs

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO1 2
CO1	H		H					M	M			
CO2	M		H	L				H	M			
CO3	M		M	H	L			H	M		M	
CO4	M		M	H	L			H	M		M	
CO5	M		M	H	L			H	M		M	

COURSE CONTENT :

UNIT I INTRODUCTION TO FEA 9

History- Purpose of FEA- Discretization model-Mesh refinement- Types of Finite elements- Boundary condition- general procedure for FEA (Preprocessing, solution, post processing)- Application of FEA

UNIT II BASICS OF MAGNET SOFTWARE 9

Introduction-Design of Object-Elements-Nodes- make component in a line- one dimension design of line,-two dimension design of Cylinder, rectangular, cube –three dimension design of fan, wheel, spanner- -initial 2D mesh-Types of solvers

UNIT III DC MACHINE 9

Principle-EMF equation- speed torque equation- Electrical/Mechanical characteristics-starters-applications - design of series DC motor: Wireframe model-solid model-Transient 2D with motion analysis

UNIT IV TRANSFORMER 9

Principle and operation-EMF equation-Phasor diagram, equivalent circuit-Application-design of core and shell type transformer: Wireframe model-solid model-static analysis

UNIT V THREE PHASE INDUCTION MOTOR 9

Three phase Induction Motor types and constructional features–Torque equation-star delta and DOL starter- applications , design of Squirrel cage Motor: Wireframe model-solid model-Transient 2D with motion analysis

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Reddy.J.N., "An introduction to the Finite Element Method,"3rd Edition, Tata McGraw-Hill,2005
2. Seshu,P, "Test book of Finite Element Analysis",Prentice-Hall of India Pvt.Ltd.,New Delhi,2007
3. Dr. P.S. Bhimbra, 'Electrical Machinery', Khanna Publications, 7th Edition, 2007.
4. Nagrath, I.J.and Kothari, D.P., 'Electrical Machines', Tata McGraw Hill Education Private Limited Publishing Company Ltd., 4th Edition, 2010.
5. M. G. Say, 'Performance and design of Alternating Current Machines', John Wiley and Sons Publications, 3rd Edition, 1983.

REFERENCE BOOKS:

1. Rao,S.S., "The Finite Element Method in Engineering",3rd edition, Butterworth Heinemann,2004
2. Logan,D.L,"A first course in Finite Element Method", Thomson Asia Pvt.Ltd.,2002
3. Edwards J.D., 'An Introduction to MagNet for 2D Modelling',2014
4. Arthur Eugene Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw Hill Education Publications, 6th Edition, 2002.
5. Vincent Del Toro, 'Electrical Engineering Fundamentals', 2nd Edition, Prentice hall Publications, 2003.
6. Parkar Smith, N.N., 'Problems in Electrical Engineering', 9th Edition, CBS Publishers and Distributers, 1984.
7. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press- Oxford, 1989.