

Subject Teacher : Md. Husne Fahad, Instructor, Electrical Technology.
 Subject Name : AC Machines - 2
 Subject Code : 66771
 Technology : Electrical
 Semester : 7th

AIMS

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of alternating current machines with special emphasis on:

1. Alternator
2. Synchronous motor
3. Single phase motor control.

SHORT DESCRIPTION

Alternators: Principle, construction, emf equation, effect of load on alternator; voltage regulation, parallel operation and starting procedure of alternator; Synchronous motor: Operation, torques and excitation, Phase swinging, Starting method and uses, Power factor correction; Single phase motor: Operation of single phase motor; Operation of AC commutator motor; Motor control: Speed control of single phase motor; Starting of three phase induction motor; Controlling speed of three phase induction motor.

Marks	Grade Point	Letter Grade	Marks	Grade Point	Letter Grade
80>	4.00	A+	55-59	2.75	B-
75-79	3.75	A	50-54	2.50	C+
70-74	3.50	A-	45-49	2.25	C
65-69	3.25	B+	40-44	2.00	D
60-64	3.00	B	0-39	0.00	F

Class Timing Distribution	
Particulars	Time
Greeting with students	10 Minutes
Previous Class Review	10 Minutes
Present Class Topic Discussion and Lecture Delivery	60 Minutes
Present Class Topics Review	10 Minutes

Mark Distribution (for 150 Marks)			
Theory Marks		Practical Marks	
Midterm	30	PC	25
Class test	20	PF	25
Quiz test	10	-	-
Final	90	-	-
Total	150	Total	50

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
	1.	1 Understand the principle of alternator.	1.1 Explain the principle of alternator. 1.2 Differentiate between generation in alternator and DC generator. 1.3 Describe the methods of excitation of alternator. 1.4 Explain the rating of alternator.	After the Class, Students will be able To know about the principle of alternator.	Projector, Internet Link: https://www.youtube.com/watch?v=tiKH48EMgKE
	2.	2. Understand the constructional features of alternators.	2.1 List the main parts of alternator. 2.2 Explain the advantages of stationary armature. 2.3 Describe the stator frame & stator core. 2.4 Classify rotor of alternator.	After the Class, Students will be able To know about the constructional features of alternators.	Projector, Internet Link: https://www.youtube.com/watch?v=6GSju8fZhSw
	3.	2. Understand the constructional features of alternators.	2.5 Describe salient pole type rotor and cylindrical type rotor 2.6 List the advantages of fractional pitch winding. 2.7 Solve problems related to pitch factor & distribution factor. 2.8 Describe damper winding.	After the Class, Students will be able To know about the constructional features of alternators.	Projector, Internet Link: https://www.youtube.com/watch?v=6GSju8fZhSw
	4.	3. Understand the principle of emf equation.	3.1 Describe emf equation. 3.3 Explain the effect of pitch factor and distribution factor on harmonics 3.2 Define harmonics: fundamental, 3rd harmonic and 5th harmonic.	After the Class, Students will be able To know about the principle of emf equation.	Projector, Internet Link: https://www.youtube.com/watch?v=BqetOHEhAGE
	5.	4. Understand the effect of load and no load condition of an alternator.	4.1 Describe alternator on no load. 4.2 Describe the effect of resistance and leakage reactance on an alternator. 4.3 Explain the effect of armature reaction on emf of alternator. 4.4 Explain synchronous reactance and synchronous impedance. 4.5 Draw the vector diagram of a loaded alternator. 4.6 Describe resistance test, no-load test / open circuit test and short circuit test of alternator. 4.7 Solve problems related to synchronous reactance and synchronous impedance. .	After the Class, Students will be able Develop concept no load condition of an alternator.	Projector, Internet Link: https://www.youtube.com/watch?v=Rm8EScaPuAg Link: https://www.youtube.com/watch?v=4tHbhF3IDwA

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	6.	Review Class	Review Class of Lecture 1,2,3 (Regarding students' problem)	Through the review class, students can solve their problem	Basic Class Materials
	7.	Quiz Test 1	Examination Topic: Chapter 1,2,3,4 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	1) Basic Class Materials 2) Examination Khata
	8.	Class Test 1	Examination Topic: Chapter 1,2,3,4 Examination mark: 20 Passing Mark: 08	Through class tests students will learn to evaluate themselves on their own	1) Basic Class Materials 2) Examination Khata
	9.	5 Understand the principle of voltage regulation and efficiency of alternator.	5.1 Define voltage regulation. 5.2 Explain voltage regulation at unity power factor, lagging power factor and leading power factor. 5.3 Solve problems related to voltage regulation of alternator. 5.4 List the losses occurred in alternator. 5.5 Explain the losses and efficiency of alternator. 5.6 Solve problems on losses and efficiency of alternator.	After the Class, Students will be able To know about the principle of voltage regulation and efficiency of alternator.	Projector, Internet Link: https://www.youtube.com/watch?v=-_TqFy-Vulk
	10.	6 Understand the principle of parallel operation and starting procedure of alternators.	6.1 Define the term synchronizing. 6.2 Describe the purposes of synchronizing alternators. 6.3 List the conditions for synchronizing. 6.4 Describe the dark & bright lamp methods of synchronizing there phase alternator. 6.5 Explain the method of paralleling the alternators by synchroscope. 6.6 Explain synchronizing current and synchronizing power. 6.7 Explain the effect of unequal voltage on synchronizing two alternators. 6.8 Describe the distributions of load between two alternators in parallel. 6.9 Describe the steps of starting an alternator.	After the Class, Students will be able To know about the parallel operation and starting procedure of alternators.	Projector, Internet Link: https://www.youtube.com/watch?v=hwheutE48gE&index=2&list=PLPpCFgQP7QKELTIJrtk9uYzPvc5CqMGff Link: https://www.youtube.com/watch?v=Wa1vPC7d3ps&list=PLPpCFgQP7QKELTIJrtk9uYzPvc5CqMGff&index=3

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	11.	7 Understand the principle of operation of synchronous motor.	7.1 Define synchronous motor. 7.2 Explain the principle of operation of synchronous motor. 7.3 Describe the effect of increase in load of synchronous motor with vector diagram.	After the Class, Students will be able To know about operation of synchronous motor.	Projector, Internet Link: https://www.youtube.com/watch?v=AvvtvVUz85o
	12.	8. Understand the torques and excitation of a synchronous motor.	8.1 Describe different types of torque. 8.2 Explain the effect of excitation on armature current and power factor with vector diagram. 8.3 Construct V-curves. 8.4 Explain V-curves. 8.5 Describe the different point and position of V- curve in respect of power factor	After the Class, Students will be able To know about the torques and excitation of a synchronous motor.	Projector, Internet Link: https://www.youtube.com/watch?v=ffz2bOQl5hs
	13.	Review Class	Review Class of Chapter 5,6,7,8 (Regarding students' problem)	Through the review class, students can solve their problem	Basic Class Materials
	14.	Quiz Test 2	Examination Topic: Chapter 5,6,7,8 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	3) Basic Class Materials 4) Examination Khata
	15.	Class Test 2	Examination Topic: Chapter 5,6,7,8 Examination mark: 20 Passing Mark: 08	Through class tests students will learn to evaluate themselves on their own	3) Basic Class Materials 4) Examination Khata
	16.	Midterm Exam Syllabus Review			
	17.	9. Understand the hunting or phase swinging of synchronous motor	9.1 Explain hunting or phase swinging. 9.2 List the disadvantages of hunting. 9.3 Explain the disadvantages 9.4 Remedies of hunting	After the Class, Students will be able Develop knowledge and skill of swinging of synchronous motor phase	Projector, Internet Link: https://www.youtube.com/watch?v=WKjLOgfRnKY
	18.	10 Understand the starting method and uses of synchronous motor.	10.1 List the methods of starting synchronous motor. 10.2 Describe the procedures of starting a synchronous motor. 10.3 Compare synchronous motor with induction motor.	After the Class, Students will be able Develop knowledge and skill of uses of synchronous motor	Projector, Internet Link: https://www.youtube.com/watch?v=80uxMISyzxI

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			10.4 Mention the field of application of synchronous motor.		
	19.	11. Understand the principle of power factor corrections.	11.1 Define synchronous condenser. 11.2 Distinguish between synchronous motor and synchronous condenser. 11.3 Explain the methods of power factor corrections with the help of synchronous motor and synchronous condenser. 11.4 Solve problems on power factor correction related to synchronous condenser.	After the Class, Students will be able To Know about the principle of power factor corrections.	Projector, Internet Link: https://www.youtube.com/watch?v=80uxMISyxl
	20.	12 Understand the principle of operation of AC commutator motor.	12.1 Describe the principle of operation of Schrage (poly phase commutator motor) motor. 12.2 Application of Schrage motor. 12.3 Mention the advantages and disadvantages of Schrage motor	After the Class, Students will be able To Know about AC commutator motor.	Projector, Internet Link: https://www.youtube.com/watch?v=WKjLOgfRnKY
	21.	Review Class	Review Class of Chapter 9,10,11,12 (Regarding students' problem)	Through the review class, students can solve their problem	Basic Class Materials
	22.	Quiz Test 3	Examination Topic: Chapter 9,10,11,12 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	5) Basic Class Materials 6) Examination Khata
	23.	Class Test 3	Examination Topic: Chapter 9,10,11,12 Examination mark: 20 Passing Mark: 08	Through class tests students will learn to evaluate themselves on their own	5) Basic Class Materials 6) Examination Khata
	24.	13. Understand the principle of operation of single-phase motor.	13.1 Explain why single-phase motor is not self-starting. 13.2 Describe double revolving field theory and cross magnetizing field theory. 13.3 List the methods of making single phase motor self-starting. 13.4 Describe standard split phase motor 13.5. Describe capacitor motor and double capacitor motor.	After the Class, Students will be able To Know about the operation of single-phase motor.	Projector, Internet Link: https://www.youtube.com/watch?v=awrUxv7B-a8

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	25.	13. Understand the principle of operation of single-phase motor.	13.6 Describe shaded pole motor & repulsion motor. 13.7 Describe hysteresis motor, universal motor, reluctance motor & AC series Motor 13.8 Explain the losses and efficiency of single-phase motor. 13.9. Understand the working principle of stepper motor. 13.10 Explain Types, advantages and application of stepper motor	After the Class, Students will be able To Know about operation of single-phase motor.	Projector, Internet Link: https://www.youtube.com/watch?v=awrUxv7B-a8
	26.	14. Starting and Speed Control of Single-Phase Induction Motor.	14.1 Understand the principle of speed control of single-phase motor. 14.2 List the methods of speed control of single-phase motor. 14.3 Describe the methods of speed control of single-phase motor. 14.4 Describe the method of reversing the direction of rotation of single-phase induction motor using timers and relays.	After the Class, Students will be able To Know about Speed Control of Single-Phase Induction Motor.	1-phase induction motor. https://www.youtube.com/watch?v=JJfORJqVIt0
	27.	15. Understand the Starting and Speed Control of Three Phase Induction Motor.	15.1 Describe the operation of three phase induction motor by auto-transformer action using relay and timer. 15.2 Describe the methods of reversing the direction of rotation of three phase induction motor using relay and timer. 15.3 Describe the methods of controlling speed of three phase induction (squirrel cage) motor by reduced voltage method using relays and timers. 15.4 Describe the methods of controlling speed of three phase induction (wound rotor) motor by inserted resistance.	After the Class, Students will be able To Know about magnetic field. To Know about Speed Control of Three Phase Induction Motor.	Projector, Internet Link: https://www.youtube.com/watch?v=UfiNbIUN7G0 Link: https://www.youtube.com/watch?v=a7hXiFP7voc
	28.	Review Class	Review Class of Chapter 13,14,15 (Regarding students' problem)	Through the review class, students can solve their problem	Basic Class Materials
	29.	Quiz Test 4	Examination Topic: Chapter 13,14,15 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	7) Basic Class Materials 8) Examination Khata
	30.	Class Test 4	Examination Topic: Chapter 13,14,15 Examination mark: 20	Through class tests students will learn to evaluate themselves on their own	7) Basic Class Materials

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			Passing Mark: 08		8) Examination Khata
	31.	Presentation	Short presentation by individual student.	Be confident on practical life.	Laptop, projector
	32.	MODEL TEST	All Syllabus	After the Class, Students will be highly confident for Final exam	Basic Class Materials
	33.	Final Exam Syllabus Review			
	34.	Final Exam Syllabus Review			
	35.	Final Exam Syllabus Review			