

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

Daffodil Polytechnic Institute, Institute Code: 50238

Lesson Plan – Academic session: August 2023 to January 2024

Subject Teacher : Md. Shafikul Islam(Milon)
 : Sr. Instructor, Electrical Technology.
 Subject Name : DC Machines
 Subject Code : 66742
 Technology : Electrical
 Semester : 4th
 BTEB Text Book Name : (Publisher: RS PUBLICATION)

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

AIMS

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

- Promote knowledge and skill on Cell & Battery and the process of electroplating.
- Provide understanding on DC generator.
- Develop knowledge and skill on DC motor.

- Maintain knowledge on characteristics of DC generator.
- Develop knowledge on electric traction.

Outcome

- ✓ My Students will be able to understand Cell and Battery: principle of operation, construction, testing, uses and maintenance of battery.
- ✓ My Students will be able to understand DC Generator: Principle, construction, winding, losses, efficiency, characteristics and parallel operation.
- ✓ They will be able to DC Motor: Principle, construction, torque/speed curves, efficiency, speed control, starting and tests.
- ✓ They can Identify DC Generator and DC Motor.
- ✓ They will be able to understand Electric traction.

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
	1.	Understand the construction of different types of cell and battery.	1.1 Describe the construction of dry cell and its chemical reaction. 1.2 Illustrate the construction of alkaline batteries. 1.3 Describe the construction of lead acid battery and its chemical reaction.	After the Class, Students will be able to know ✓ construction of dry cell ✓ construction of lead acid battery After the Class, Students will be able to Know construction of alkaline batteries.	Basic Class Materials & Projector, Dry cell Youtub link: https://www.youtube.com/watch?v=UEPJXSw7HA

2.	Understand the features of battery charging.	<p>2.1 Name the types of battery charging system.</p> <p>2.2 Describe the charging procedure of battery by 220-230VAC source.</p> <p>2.3 Explain the procedure of slow charging.</p> <p>2.4 Describe the procedure of quick charging.</p>	<p>After the Class,</p> <p>✓ Students will be able to know different types of battery charging.</p> <p>✓ They will be able to explain the procedure of slow & quick charging.</p>	Basic Class Materials & Projector, lead acid battery 12
3.	Understand the features of battery charging.	<p>2.5 Describe the procedure of preparing electrolyte.</p> <p>2.6 Outline the construction of dry charged battery.</p> <p>2.7 Explain the charging procedure of sulfated battery.</p> <p>2.8 Describe the process of charging more than one battery at a time.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the construction of dry charged battery.</p> <p>✓ They will be able to charging procedure of sulfated battery.</p>	Basic Class Materials & Projector, Dry cell Youtub link: https://www.youtube.com/watch?v=3wLJLm0QLpg
4.	Understand the process of electroplating.	<p>4.1 State fundamental principles of electroplating.</p> <p>4.2 State Faraday's laws of electrolysis.</p> <p>4.3 Describe briefly the process of extraction and refining of metals.</p> <p>4.4 State a simple method of producing copper plating upon a carbon brush.</p> <p>4.5 Describe electro-deposition process.</p> <p>4.6 Identify power supply for electrolytic process adopted in electroplating.</p>	<p>After the Class,</p> <p>✓ Students will be able to know the principles of electroplating.</p> <p>✓ Students will be able to know Faraday's laws of electrolysis.</p> <p>✓ They will be able to derive simple method of producing copper plating upon a carbon brush.</p>	Basic Class Materials & Projector, copper plate Youtub link: https://www.youtube.com/watch?v=OxhCU_jBiOA

5.	Understand the working principle of DC generator.	<p>5.1 State generator principle.</p> <p>5.2 Mention the types or Classification of DC generator.</p> <p>5.3 Mention the conditions for generation of emf in a single coil generator.</p> <p>5.4 Describe the constructional details of a DC generator.</p> <p>5.5 Explain the functions of different parts/components of a DC generator.</p> <p>5.6 Sketch the magnetic circuit of a DC generator.</p>	<p>After the Class,</p> <ul style="list-style-type: none"> ✓ Students will be able to know about the generator principle. ✓ They will be able to constructional details of a DC generator. ✓ Students will be able to know components of a DC generator. 	Basic Class Materials & Projector, lather wet paper
6.	Understand the working principle of DC generator.	<p>5.7 Express the deduction of the e.m.f equation of a DC generator.</p> <p>5.8 List the various losses in a DC generator.</p> <p>5.9 Explain power stages of a DC generator.</p> <p>5.10 Express the condition for maximum efficiency.</p> <p>5.11 Solve problems relating to DC generator.</p>	<p>After the Class,</p> <ul style="list-style-type: none"> ✓ Students will be able to explain various losses in a DC generator ✓ They will be able to the condition for maximum efficiency. 	<p>Basic Class Materials & Projector,</p> <p>Youtub link: https://www.youtube.com/watch?v=-xebh8wU8gY</p>
7.	Review Class	Review Class of Lecture 1,2,3,4,5 (Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
8.	Quiz Test 1	Examination Topic: Chapter 1,2,3,4,5 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	<p>1) Basic Class Materials</p> <p>2) Examination Khata</p>
9.	Class Test 1	Examination Topic: Chapter 1,2,3,4,5 Examination mark: 20 Passing Mark: 08	Through class tests students will learn to evaluate themselves on their own	<p>1) Basic Class Materials</p> <p>2) Examination Khata</p>

10.	Understand the principle of winding of DC generator.	<p>6.1 Define the terms pole pitch, coil pitch, front pitch, back pitch, average pitch and commutation pitch.</p> <p>6.2 Describe lap and wave winding.</p> <p>6.3 Sketch the developed diagram of simplex and duplex (lap and wave) winding.</p> <p>6.4 Name at least four major differences between the lap and wave windings</p>	<p>After the Class,</p> <p>✓ They will be known about principle of winding of DC generator.</p> <p>✓ Student Will be able to know major differences between the lap and wave windings</p>	<p>Basic Class Materials & Projector, super enamel wire</p> <p>Youtub link: https://www.youtube.com/results?search_query=lap+and+wave+windings+</p>
11.	Understand the armature reaction and commutation of DC generator	<p>7.1 Explain armature reaction.</p> <p>7.2 Describe the effect of armature reaction.</p> <p>7.3 State de-magnetizing and cross magnetizing.</p> <p>7.4 Explain the action of commutation.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the effect of armature reaction.</p> <p>✓ They will be able to explain the action of commutation.</p>	<p>Basic Class Materials & Projector</p>
12.	Understand the armature reaction and commutation of DC generator	<p>7.5 Identify the value of reactance voltage.</p> <p>7.6 Mention the methods of improving commutation.</p> <p>7.7 Explain the necessity of interlopes and compensating winding.</p> <p>7.8 State the need for equalizing bar and rings.</p>	<p>After the Class,</p> <p>✓ Students will be able to identify the value of reactance voltage.</p> <p>✓ They can describe the need for equalizing bar and rings.</p>	<p>Basic Class Materials & Projector</p>
13.	Understand the principle of excitation.	<p>8.1 Explain the excitation of DC generator.</p> <p>8.2 Explain the necessity of excitation.</p> <p>8.3 Mention self excited and separately excited generator.</p> <p>8.4 Describe the condition for excitation.</p>	<p>After the Class, Students will be able to explain</p> <p>✓ The excitation of DC generator.</p> <p>✓ Mention self excited and separately excited generator.</p> <p>✓ The condition for excitation.</p>	<p>Basic Class Materials & Projector, voltage regulator</p>

14.	Understand the characteristics of DC generator.	<p>9.1 Explain the process of building up voltage of shunt generator.</p> <p>9.2 State the critical resistance and critical speed for shunt generator.</p> <p>9.3 Plot the terminal voltage Vs load current characteristic curve of shunt generator.</p> <p>9.4 State the reasons for decreasing terminal voltage with increasing load.</p> <p>9.5 Plot the internal and external characteristic curve of DC shunt, series and compound generator.</p> <p>9.6 Solve related problems relating to shunt generator</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the critical resistance and critical speed for shunt generator.</p> <p>✓ They can draw the terminal voltage Vs load current characteristic curve of shunt generator.</p>	<p>Basic Class Materials & Projector, Youtub link: https://www.youtube.com/watch?v=zt0N0o-sb2A</p>
15.	Understand the concept of voltage regulation and efficiency of a DC generator.	<p>10.1 Explain the formula for voltage regulation of a DC generator.</p> <p>10.2 Discuss the importance of voltage regulation of DC generator.</p> <p>10.3 Solve problems relating to voltage regulation of DC generator.</p> <p>10.4 Express the formula for efficiency of a DC generator.</p> <p>10.5 Solve problems relating to efficiency of a DC generator.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the formula for voltage regulation of a DC generator.</p> <p>✓ They can express the formula for efficiency of a DC generator.</p> <p>✓ They will be able to solve problems relating to voltage regulation of DC generator.</p>	<p>Basic Class Materials & Projector</p>
16.	Review Class	<p>Review Class of Lecture 6,7,8,9,10 (Regarding students problem)</p>	<p>Through the review class, students can solve their problem</p>	<p>Basic Class Materials</p>
17.	Quiz Test 2	<p>Examination Topic: Chapter 6,7,8,9,10</p> <p>Examination mark: 10 Passing Mark: 04</p>	<p>Through Quiz Test students will learn the intellectual intelligence on the topics discussed.</p>	<p>3) Basic Class Materials 4) Examination Khata</p>
18.	Class Test 2	<p>Examination Topic: Chapter 6,7,8,9,10 Examination mark: 20</p>	<p>Through class tests students will learn to evaluate themselves on their own</p>	<p>3) Basic Class Materials 4) Examination Khata</p>

			Passing Mark: 08		
	19.	Exam Syllabus Review			
	20.	Understand the principle of parallel operation of DC generator.	<p>11.1 State the need for parallel operation of DC generator (shunt, series and compound)</p> <p>11.2 List the conditions for parallel operation of DC generator.</p> <p>11.3 Discuss the condition of sharing loads in DC generators operating in parallel.</p> <p>11.4 Draw the circuit diagram of two long shunt compound generators connected in parallel.</p> <p>11.5 Calculate the load shared by individual machine at the time of parallel operation.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the conditions for parallel operation of DC generator.</p> <p>✓ They will be able to calculate the load shared by individual machine at the time of parallel operation.</p>	<p>Basic Class Materials & Projector</p> <p>Youtub link: https://www.youtube.com/watch?v=Jh167TEECBk</p>
	21.	Understand the working principle of DC motor.	<p>12.1 Explain the working principle of DC motor.</p> <p>12.2 Mention the types or Classification of DC Motor.</p> <p>12.3 Explain generator action of motor.</p> <p>12.4 Explain the significance of the back emf.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the working principle and Classification of DC motor.</p>	<p>Basic Class Materials & Projector, mini DC motor 12v</p>
	22.	Understand the Working principle of DC motor.	<p>12.5 Express the deduction of voltage equation of motor.</p> <p>12.6 Define the term torque (mentioning its unit), running torque and break down torque.</p> <p>12.7 Express the deduction of equation for speed of DC motor (for series and shunt motors).</p> <p>12.8 Plot the torque/speed curve of series, shunt and compound motors.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the deduction of voltage equation of motor.</p> <p>✓ They will be Plot the torque/speed curve of series, shunt and compound motors.</p>	<p>Basic Class Materials & Projector, mini DC motor 12v</p> <p>Youtub link: https://www.youtube.com/watch?v=Jh167TEECBk</p>
	23.	Understand losses and efficiency.	<p>13.1 State the losses in DC motor.</p>	<p>After the Class,</p>	<p>Basic Class Materials & Projector, cotton tap</p>

			<p>13.2 Calculate the efficiency of DC motor from a given data.</p> <p>13.3 Explain the power stages of DC motor.</p> <p>10.11 Solve problems related to slip</p>	<p>✓ Students will be able to know about the losses in DC motor.</p> <p>✓ They will be able to solve problems related to slip</p>	
24.	Understand the starting methods and speed control of DC motor.	<p>14.1 Describe the factors controlling the speed of DC motor.</p> <p>14.2 Discuss the general methods of speed control of DC motor.</p> <p>14.3 Explain speed control of shunt, series and compound motor.</p> <p>14.4 Mention the merits and demerits of rheostat control method.</p> <p>14.5 Describe electric braking of shunt and series motor.</p>	<p>After the Class,</p> <p>✓ Students will be able to know about the factors controlling the speed of DC motor.</p> <p>✓</p> <p>✓ Students will be able to know speed control of shunt, series and compound motor.</p>	Basic Class Materials & Projector, Ammeter	
25.	Understand the starting methods and speed control of DC motor.	<p>14.6 Explain the necessity of a starter for DC motor.</p> <p>14.7 Describe three point and four point starter used in DC motor.</p> <p>14.8 Explain the heating and cooling of DC machine.</p> <p>14.9 Explain brake test and no-load test of DC motor.</p>	<p>After the Class,</p> <p>✓ Students will be able to explain the necessity of a starter for DC motor.</p> <p>✓ The will be able to know the heating and cooling of DC machine</p>	<p>Basic Class Materials & Projector,</p> <p>Youtub link: https://www.youtube.com/watch?v=ol-O9FCDqmg</p>	
26.	Review Class	Review Class of Lecture 11,12,13,14 (Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials	
27.	Quiz Test 3	Examination Topic: Chapter 11,12,13,14 Examination mark: 10 Passing Mark: 04	Through Quiz Test students will learn the intellectual intelligence on the topics discussed.	<p>5) Basic Class Materials</p> <p>6) Examination Khata</p>	

	28.	Class Test 3	Examination Topic: Chapter 11,12,13,14 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
	29.	Understand the system of electric traction.	15.1 State the meaning of electric traction. 15.2 Describe the system of electric traction. 15.3 List the characteristics of an ideal traction system. 15.4 Describe the feeding and distribution system for tram ways and trolley buses.	After the Class, ✓ Students will be able to know about the system of electric traction. ✓ Students will be able to know about the characteristics of an ideal traction system.	Basic Class Materials & Projector, Youtub link: https://www.youtube.com/watch?v=tnHRpCsm160
	30.	Understand the system of electric traction.	15.5 Explain the diesel electric drive, battery electric drive and electric drive of locomotives. 15.6 Explain the working principle of tram ways and trolley buses. 15.7 Explain the DC system used in traction. 15.8 Explain the reasons for using DC series motor for traction purpose starting slip ring induction motor. .	After the Class, ✓ Students will be able to know about the working principle of tram ways and trolley buses. ✓ Students will be able to know about the DC system used in traction.	Basic Class Materials & Projector, mini AC motor 12v
	31.	Understand the concept of speed control of traction motors.	16.1 Explain different methods of speed control of DC traction motors. 16.2 Explain starting methods and speed control of DC series motor. 16.3 Explain starting method of 3-phase induction motor used in traction. 16.4 Explain speed control system of 3-phase induction motor used in traction. 16.5 Explain different braking systems. 16.6 Explain the systems of supplying power in electric traction.	After the Class, ✓ Students will be able to know about the speed control of induction motor. ✓ They will be able to control the speed of an induction motor.	Basic Class Materials & Projector, mini AC motor 12v Youtub link: https://www.youtube.com/watch?v=tnHRpCsm160
	32.	Review Class	Review Class of Lecture 15,16 (Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials

	33.	Quiz Test 4	Examination Topic: Chapter 15,16 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
	34.	Class Test 4	Examination Topic: Chapter 15,16 Examination mark: 20 Passing Mark: 08	Through class tests students will learn to evaluate themselves on their own	7) Basic Class Materials 8) Examination Khata
	35.	Presentation	Short presentation by individual student.	Be confident on practical life.	Laptop, projector
	36.	MODEL TEST	All Syllabus	After the Class, Students will be highly confident for Final exam	Basic Class Materials
	37.	Final Exam Syllabus Review			
	38.	Final Exam Syllabus Review			
	39.	Final Exam Syllabus Review			