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:February 2023 toAugust 2023

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**

Class Timing Distribution	
Particulars	**Time**
Greeting with students	05 Minutes
Previous Class Review	05 Minutes
Present Class Topic Discussion and Lecture Delivery	30 Minutes
Present Class Topics Review	05 Minutes

Subject Teacher : PULAK BISWAS
Instructor, Electrical Technology.
Subject Name : SWITCHGEAR AND PROTECTION
Subject Code : 66773
Technology : Electrical
Semester : 7th
BTEB Text Book Name : (Publisher: HAQUE PUBLICATION)
Reference Book : Principle of Power System (V.K MEHTA , ROHIT MEHTA)

Subject Aims:

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of switchgear and protection with special emphasis on :
- Busbar and sub-station equipment.
- Circuit breakers and relays.
- Protection system for busbar, alternators, transformer, feeder and transmission line.
- Protection against over voltage.
- Sub station.

Subject Outcome:
After the semester, Students will be able to detect & operate Switch gear; Electrical faults; Busbar arrangements; Short circuit current calculation; power system stability**;** Current limiting reactors; Fuses; Circuit breakers; Relays; Protection of alternator & transformer; Protection of feeder & transmission line; Busbar protection; Over-voltage on transmission line; Protection against lightning; Sub-station.

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
	1	**Understand the concepts of switch gear.**	1.1 Define switch gear. 1.2 Discuss the importance of switch gear protection of electrical system. 1.3 List different types of switch gear. 1.4 List the switch gear equipment	After the Class, Students will be able to know the concepts of switch gear	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=ejC7bTBQo24

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
	2	**Understand the concepts of electrical faults**	2.1 Define electrical faults. 2.2 Name the different types of faults in electrical power system. 2.3 Discuss the causes of faults in electrical power system. 2.4 Describe different types of faults in electrical power system.	After the Class, Students will be able to know concepts of electrical faults	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=gOT8jx4jEzM
	3	**Understand the concepts of busbar arrangements**	3.1 Define busbar. 3.2 Describe different types of busbar. 3.3 Mention different types of busbar arrangements. 3.4 Explain different types of busbar arrangements. 3.5 Mention different types of faults in busbar.	After the Class, Students will be able to know different types of busbar	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=ZU4y6vsabP4&t=343s
	4	**Experiment no 01**	Re-winding the Single Phase motor	After the Class, Students will be able to rewinding a single Phase motor	1 phase motor, capacitor, wire ,
	5	**Review Class**	Review Class of Lecture 01, 02,03 **(**Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	6	**Understand the short circuit current calculation**	4.1 Define short circuit faults. 4.2 Describe the causes of short circuit fault. 4.3 Name different types of short circuit fault. 4.4 Mention the steps for symmetrical fault calculations. 4.5 Distinguish between symmetrical and unsymmetrical fault. 4.6 Explain the method of calculation of short circuit current. 4.7 Distinguish between per unit method and percentage method. 4.8 Discuss the advantages of per unit methods	After the Class, Students will be able to know the method of calculation short circuit current	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=GGVIaQbeJHo

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
			of short circuit current calculation		
	7	**Understand the short circuit current calculation**	4.9 Solve problems on short circuit current calculation.	After the Class, Students will be able to calculate short circuit current	Basic Class Materials
	8	**Experiment no 02**	Identify the R,Y,B terminals of a 3 Phase motor and Reverse and Forword	After the Class, Students will be able to operate 3 phase electrical motor	1 phase motor, capacitor, wire , power supply, AVO meter , megger
	9	**Understand the short circuit current calculation**	4.9 Solve problems on short circuit current calculation.	After the Class, Students will be able to calculate short circuit current	Basic Class Materials
	10	**Understand the power system stability.**	5.1 Define stability. 5.2 Describe transient, dynamic and steady state stability. 5.3 Explain swing equation 5.4 Discuss the factors affecting transient stability. 5.5 Explain the method of improving transient stability. 5.6 Discuss the effect of sudden change in mechanical input.	After the Class, Students will be able to know about power system stability.	Basic Class Materials
	11	**Review Class**	Revi ew Class of Lecture 06,07,08,09,10 **(**Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	12	**Experiment no 03**	Run a 3 Phase motor by connecting relay and timer	After the Class, Students will be able to use switchgear equipment to operate 3 phase electrical motor	3 phase motor, wire , power supply, AVO meter , megger Circuit breaker ,relay, 3 phase Ac Power supply
	13	**Quiz Test 1**	Examination Topic: **Chapter 1,2,3,4,5** Examination mark: 10	Through Quiz Test students will learn the intellectual intelligence on the	1) Basic Class Materials 2) Examination Khata

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
			Passing Mark: 04	topics discussed	
	14	**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	1) Basic Class Materials 2) Examination Khata
	15	**Understand the principle of operation of current limiting reactors.**	6.1 Define current limiting reactor. 6.2 Describe the principle of operation of current limiting reactor. 6.3 Describe different types of current limiting reactors with diagram. 6.4 List the advantages and disadvantages of different types of current limiting reactor (CLR).	After the Class, Students will be able to know the principle of operation of current limiting reactors	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=M4OeqmKEl7c
	16	**Experiment no 03**	Run 3 Phase motor by connecting The relay and timer	After the Class, Students will be able to use switchgear equipment to operate 3 phase electrical motor	3 phase motor, wire , power supply, AVO meter , megger Circuit breaker ,relay, 3 phase Ac Power supply
	17	**Understand the principle of operation of current limiting reactors.**	6.5 Solve problems related to the current limiting reactor (CLR).	After the Class, Students will be able to calculate short circuit current	Basic Class Materials
	18	**Understand the operation and construction of fuses.**	7.1 Describe the principle of operation of fuses. 7.2 List different types of fuses. 7.3 Describe the current ratings of fusing element, fusing factor and breaking capacity. 7.4 Classify fuses according to the construction and current carrying capacity. 7.5 Describe the constructional features of the fuses: High	After the Class, Students will be able to know the operation and construction of fuses	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=3HQG3W6PolU https://www.youtube.com/watch?v=JzFQquIATlI
	19	**Understand the concept of**	8.1 Define circuit breaker. 8.2 Describe the principle of operation of a circuit breaker and its function.	. After the Class, Students will be able to know the concept of construction and operation of circuit breaker	Basic Class Materials & Projector Youtube Link:

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
		construction and operation of circuit breaker.	8.3 Describe arc and the process of its production & extinguishment. 8.4 Describe the construction and the principle of operation of the following circuit breakers: Plain–break type circuit breaker. Oil Circuit Breaker (OCB),Low oil content circuit breaker., Air Circuit Breaker (ACB)., Gas [Sulphur-Hexafluoride,SF_6] circuit breaker., Vacuum Circuit Breaker(VCB)., Magnetic actuator type Circuit Breake		https://www.youtube.com/watch?v=Cq55tbLtnlg https://www.youtube.com/watch?v=P3x2tvmgkjg https://www.youtube.com/watch?v=GKI2mn3zp44 https://www.youtube.com/watch?v=TA8iyWtcVUQ https://www.youtube.com/watch?v=FmzpODUNrJg https://www.youtube.com/watch?v=ctlzKu-sYt8 https://www.youtube.com/watch?v=UF5EDV6T7es https://www.youtube.com/watch?v=dW2YYABJAac
	20	**Experiment no 04**	To know and be aware of different types of controlling and protective device	After the Class, Students will be able to use switchgear equipments	Fuse ,Circuit Breaker ,Switch, Bus-bar,Veriable Resistor, Variac ,ware gauge
	21	**Understand the features of relay.**	9.1 Define relay. 9.2 Classify the relays on the basis of construction, principle of operation, mode of use, qualities and the timing characteristics. 9.3 Describe the principle of operation and construction of the following protective and control relays: Solenoid and plunger type relay. Induction type over current relay.,Reverse power relay.,Directional over load	After the Class, Students will be able to know construction, principle of operation of relay	Basic Class Materials & Projector Youtube Link: **https://www.youtube.com/watch?v=QoCSvjyH9RU**

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
			relay,Thermal relay. Buchholz relay, Differential relay. Induction type impedance or distance relay. Induction type impedance time relay.		
	22	**Understand the features of relay.**	9.4 Describe control and relay panel. 9.5 List the factors to be considered for the maintenance of a relay	After the Class, Students will be able to use relay in electrical circuit	Basic Class Materials
	23	**Review Class**	Review Class of Lecture 15,17,18,19,21,22 **(**Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	24	**Understand the principle of operation of current limiting reactors.**	6.5 Solve problems related to the current limiting reactor (CLR).	After the Class, Students will be able to calculate short circuit current	
	25	**Quiz Test 2**	Examination Topic: **Chapter 6,7,8,9** 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
	26	**Class Test 2**	Examination Topic: **Chapter 6,7,8,9** 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
	27	**Experiment no 05**	Run a 3 phase motor with the star-delta starter	After the Class, Students will be able to use star-delta starter to operate 3 phase electrical motor	3 phase motor, wire , power supply, AVO meter , megger Circuit breaker ,relay, 3 phase Ac Power supply, star-delta starter
	28	Mid Exam Syllabous Review			
	29	Mid Exam Syllabous Review			
	30	Mid Exam Syllabous Review			
	31	**Experiment no 06**	Identifying and taking picture of various elements in the overhead line	After the Class, Students will be able to Identify various elements in the overhead line	Overhead line observation ,safety Device & equipment
	32	**Understand the principle of protection of alternator and**	10.1 List the major features of good protective gears for alternators and transformers. 10.2 List the major faults that may occur in alternator and transformer.	After the Class, Students will be able to know about the protection of alternator and transformer	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watc

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
		transformer.	10.3 Describe Merz-Price protection of alternator. 10.4 Describe Merz-Price protection of transformer.		h?v=T9QW8JCHycw&t=2215s https://www.youtube.com/watch?v=9p-IGUpvwvs
	33	**Experiment no 07**	Layout drawing of a substation	After the Class, Students will be able to understand the layout of a sub station	Drawing Paper ,pencil
	34	**Understand the principle of protection of alternator and transformer.**	10.5 Solve problems on transformer protection (Merz-Price system). 10.6 Describe the reverse power protection of alternators by reverse power relay. 10.7 Describe the internal fault protection of transformer by Buchholz relay.	After the Class, Students will be able to know about the protection of alternator and transformer	Basic Class Materials
	35	**Understand the principle of protection of feeder and transmission line**	11.1 Describe the time graded protection of radial feeder. 11.2 Describe the reverse power and over load protection of parallel feeders by over current and reverse power relay. 11.3 Describe time graded protection of ring main system..	After the Class, Students will be able to understand the principle of protection of feeder and transmission line	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=T9QW8JCHycw https://www.youtube.com/watch?v=LAiBuu_nICI
	36	**Review Class**	Review Class of Lecture 32,34,35 **(**Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	37	**Experiment no 08**	Test the cable using a loop method		Megger, Cable, Variac, Galvanometer . AVO meter, Variable resister.
	38	**Understand the principle of protection of feeder and transmission line**	11.4 Describe Merz-Price voltage balance system for protection of feeder for internal (in between the relay set) fault. 11.5 Describe Translay system of protection for internal (in between the relay set) fault of feeder. 11.6 Describe the over load protection of transmission lines by definite distance relay. 11.7 Describe the over load protection of	After the Class, Students will be able to understand the principle of protection of feeder and transmission line	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=k8PuYJmJa_w

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
			transmission line by time distance relay.		
	39	**Understand the principle of static relays and protections.**	12.1 Define static relay. 12.2 List the advantages of static relays. 12.3 Describe amplitude comparator. 12.4 Describe level detector. 12.5 Describe static-time-lag over current relay. 12.6 Describe busbar protection by static relay. 12.7 Describe busbar protection by saturable reactor protection system	After the Class, Students will be able to understand the principle of static relays and protections	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=Ca20ktPygY8
	40	**Review Class**	Review Class of Lecture 38,39 (Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	41	**Experiment no 09**	Determination of a Transformer's Ratio and the open ckt Test of the transformer	After the Class, Students will be able to perform the open ckt Test of transformer	Transformer , Ammeter ,Voltmeter, Wattmeter,
	42	**Quiz Test 3**	Examination Topic: **Chapter 10,11,12** 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
	43	**Class Test 3**	Examination Topic: **Chapter 10,11,12** 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
	44	**Understand the causes and effects of over voltage on a transmission line.**	13.1 Describe surge. 13.2 Explain the resonance in transmission line. plain the switching effect. 13.4 Describe the causes of insulation failure and its effect. 13.5 Describe the arcing earth. 13.6 Describe the construction and function of peterson coil. 13.7 Explain lightning and its effect. 13.8 Classify the lightning strokes. 13.9 Explain electrostatic induction	After the Class, Students will be able to understand the causes and effects of over voltage on a transmission line.	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=cNjUckDvfug https://www.youtube.com/watch?v=1bgtz81TXWc

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
	45	**Presentation**	Short presentation by individual student.	Be confident on practical life.	**Laptop, projector**
	34	**Understand the system of protection against lightning.**	14.1 Describe the protective function and principle of operation of a lightning arrester. 14.2 Distinguish between lightning arrester, surge diverter and surge absorber. 14.3 Describe the construction and principle of operation of the following lightning arresters: Rod gap, Horn gap Expulsion type Oxide film , Thyrite 14.4 Explain the protective function of a condenser or diverter. 14.5 Explain the function of Ferranti Surge Absorber. 14.6 Explain the function of ground wire.	After the Class, Students will be able to know the system of protection against lightning	Basic Class Materials & Projector Youtube Link: **https://www.youtube.com/watch?v=MxMjvh019II** **https://www.youtube.com/watch?v=lFTns1TBQ5s**
	46	**Understand the utility and function of a sub-station.**	15.1 Describe the function and importance of a sub station as a part of the power supply system. 15.2 Distinguish between indoor and outdoor sub-station. 15.3 List the factors to be considered in selecting the site of a sub- station. 15.4 Sketch the layout plan of an indoor sub-station. 15.5 List different components of an indoor sub station. 15.6 Mention the functions of the components of an indoor sub-station. 15.7 Sketch the layout plan of an indoor sub-station. 15.8 List different components of an outdoor sub-station and describe their function.	After the Class, Students will be able to utility and function of a sub-station	Basic Class Materials & Projector Youtube Link: https://www.youtube.com/watch?v=VfwpF68Di8k https://www.youtube.com/watch?v=l53NrBvlorQ
	47	**16. Understand the concept of Gas Insulated Sub Station(**	16.1Define Gas Insulated Sub Station (GIS) 16.2 Familiarize with different parts of a Gas Insulated Sub Station (GIS) 16.3 List the advantage of Gas Insulated Sub	After the Class, Students will be able to know the concept of Gas Insulated Sub Station(GIS**)**	Basic Class Materials & Projector Youtube Link:

Date	Lecture	Chapter/ Exam / Industrial Visit	Learning Area	Learning Outcome	Class/Lab Supporting Equipment's
		GIS)	Station (GIS) 16.4 Compare between Air Insulated Sub Station & Gas Insulated Sub Station 16.5 Describe Gas monitoring system of a Gas Insulated Sub Station 16.6 Describe Gas handling process and precaution about quality of GAS.		https://www.youtube.com/watch?v=VaSBExKx6Sw
	48	**Presentation**	Short presentation by individual student.	Be confident on practical life.	**Laptop, projector**
	49	**Review Class**	Review Class of Lecture 44-47 **(**Regarding students problem)	Through the review class, students can solve their problem	Basic Class Materials
	50	**Quiz Test 4**	Examination Topic: **Chapter 13,14,15,16** 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
	51	**Class Test 4**	Examination Topic: **Chapter 13,14,15,16** 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
	52	**Experiment no 10**	Perform various types of tests on an electrical motor by using megger	After the Class, Students will be able to Perform various types of tests on an electrical motor by using megger	Megger , Electrical motor,
		Final Exam Syllabous Review			
	54	Final Exam Syllabous Review			
	55	Final Exam Syllabous Review			