National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Year of Regulation	**2019-20**
Department	**Electrical Engineering**	Semester	**VI**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE 304	**Switchgear and Protection**	**3**	**1**	**0**	**4**	**50**	**50**	**100**	**200**

Course Objectives	Course Outcomes		
To introduce electrical switchgear and protective relays		CO1	**Able to acquire knowledge about switchgears and identification of its application**
To teach the computation of fault current in the electrical system		CO2	**Able to acquire knowledge about protective relays and identification of application**
To develop an ability and skill to design various relay settings		CO3	**Able to compute the fault current and design of switchgears**
To develop an ability and skill to design various electrical protection schemes		CO4	**Able to design of protective relays**
		CO5	**Able to design of protection schemes for electrical equipments**

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**3**
2	CO2	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**	**2**
3	CO3	**2**	**3**	**3**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**2**
4	CO4	**2**	**2**	**3**	**0**	**2**	**2**	**3**	**0**	**2**	**0**	**0**	**1**	**2**	**3**	**2**
5	CO5	**2**	**2**	**3**	**0**	**2**	**2**	**3**	**0**	**2**	**0**	**0**	**1**	**3**	**3**	**3**
6	CO6	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs

I	**Introduction** **Substation equipments, fault clearing process, different types of switchgears**	**04**	**CO1**
II	**Circuit Breakers** **Properties of arc, Arc interruption theories, Re-striking and Recovery voltage, Resistance switching, Current chopping, capacitive current interruption, auto reclosing, classification, construction, functioning, selection, and applications of circuit breakers, ratings, recent developments in circuit breakers**	**10**	**CO1**
III	**L.T. Switchgears** **Characteristics & applications of other circuit breaking devices such as miniature air circuit breakers, moulded case circuit breakers, contactor types, re-wirable & H.R.C. fuses, earth leakage breakers**	**07**	**CO1** **CO2**
IV	**Protective Relaying** **Basic requirements of protective relaying, classification of relays, non-directional over-current and directional over current relay, differential and distance relays, carrier current protection, negative phase sequence, harmonic restraint relays, reverse power, earth fault relays**	**12**	**CO2** **CO3** **CO4**
V	**Protection Schemes** **Types of faults and protection schemes for alternators, transformers, bus-bars, transmission lines, feeders, lightning arrester, arcing grounds, neutral earthing**	**10**	**CO4** **CO5**
VI	**Intelligent Protection** **Introduction to digital and numerical relays, microcontroller/microprocessor based current, voltage, frequency and distance relays**	**05**	**CO2** **CO4**
Total Hours		**48**	

Essential Readings

1. P. M. Anderson, “Power System Protection”, JW and IEEE Press, 1st Edition, 1998.
2. S. S. Rao, “Switchgear Protection and Power Systems”, Khanna Publishers, 13th Edition, 1977.

Supplementary Readings

1. C. R. Mason, “Art & Science of Protective Relaying”, John Wiley & Sons, 6th Edition, 1967.

2. T. S. M. Rao, “Solid State Protective Relaying”, Tata McGraw-Hill, 2nd Edition, 2001.
3. Y. G. Paithankar and S.R. Bhide, “Fundamentals of Power Systems Protection”, PHI, 2nd Edition, 2013.