

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Power System Protection and Switchgear Practical
Course Code:	2ET1090702P
Pre-requisite Course:	--

Course Objectives:

1. Understand the need, philosophy and principles of power system and switchgear protection.
2. Acquire skill to design specific protection schemes require for each part of a power system.
3. Understand the different relays and its characteristics & applications.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1	-	-	2	2	-	-	-	-	10	25	10	25	50

Course Contents:

Sr. No	Detail of Practical	Contact Hours
1	Identify various switchgear equipment available in the lab and write its specification and symbols.	02
2	To demonstrate the arc extinction techniques in circuit breakers.	02
3	To perform the Insulation resistance test, contact resistance test and operation (open/close) test of the circuit breaker.	02
4	Dismantle a Vacuum circuit breaker.	02
5	Test overload relay and plot Time-Current characteristic.	02
6	To determine the Plug Setting Multiplier (PSM) and Time Setting Multiplier (TSM) for over current relay.	04
7	Use Buchholz relay for transformer protection.	02
8	To study the operating characteristics of a distance protection scheme.	02
9	Test static relay for the protection of motor.	02
10	To study the impedance protection scheme and plot the operating characteristics of the impedance relay.	02
11	To study the distance relay characteristics.	02
12	To study the admittance (mho) protection scheme and observe relay operation for different values of impedance and fault angles.	02
13	To test the setting and pick up & trip time of digital over-current relay.	02
14	To observe the ratio test, polarity test and burden calculation of the CT and PT.	02

- **Additional Practical will be conducted in accordance with the relevant theory course content.**

Reference Books:

1. Protection and Switchgear- Bhavesh Bhalja, R. P. Maheshwari and N. G. Chothani, Oxford University Press, New Delhi, 2nd Edition, 2018.
2. Power System Protection and Switchgear- B. Ravindranath and M. Chander, New age International, 2nd edition, 2011.
3. Switchgear and Protection- Sunil S Rao, Khanna Publishers, 10th edition.
4. Power System Protection and Switchgear- Bhuvnesh Oza, Nirmalkumar Nair, Rashesh Mehta and Vijay Makwana, Tata McGraw Hill Education Private Limited, 2012.

ICT/ MOOCS:

1. <https://nptel.ac.in/courses/108101039>
2. <https://nptel.ac.in/courses/108107167>
3. <https://nptel.ac.in/courses/108105167>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the significance of power system and switchgear protection.	2 Understanding
CLO2	Explore the fundamentals of different protective devices.	1 Remembering
CLO3	Identify the components, types, and features of the protection scheme for different apparatus and system.	4 Analyzing
CLO4	Acquire skill to design specific protection schemes require for each part of a power system.	5 Evaluating
CLO5	Understand the basic principles of digital protection and WAMS.	2 Understanding

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PS O1	PS O2	PS O3	PS O4
CLO1	H	M	M	L	L	M	H		L	L	L	H	L			L
CLO2	H	M	M	H	L	H	H		L	L	M	H	L			
CLO3	H	M	H	M	M	M	M	L			L	H	M	L	L	M
CLO4	H	H	H	H	M	H	H	L	M	L	H	M	M	H	L	
CLO5	H	M	M	H	H	M	M				L	L	L			H

H: High, M: Medium, L: Low