SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	EE3501	Power System Analysis	PCC	3	0	0	3	3
2.	EE3591	Power Electronics	PCC	3	0	0	3	3
3.	EE3503	Control Systems	PCC	3	0	0	3	3
4.		Professional Elective I	PEC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
6.		Professional Elective III	PEC	3	0	0	3	3
7.		Mandatory Course-I[&]	MC	3	0	0	3	0
PRACTICALS								
8.	EE3511	Power Electronics Laboratory	PCC	0	0	3	3	1.5
9.	EE3512	Control and Instrumentation Laboratory	PCC	0	0	4	4	2
			TOTAL	**21**	**0**	**7**	**28**	**21.5**

[&] Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	EE3601	Protection and Switchgear	PCC	3	0	0	3	3
2.	EE3602	Power System Operation and Control	PCC	3	0	0	3	3
3.		Open Elective – I*	OEC	3	0	0	3	3
4.		Professional Elective IV	PEC	3	0	0	3	3
5.		Professional Elective V	PEC	3	0	0	3	3
6.		Professional Elective VI	PEC	3	0	0	3	3
7.		Mandatory Course-II[&]	MC	3	0	0	3	0
8.		NCC Credit Course Level 3[#]		3	0	0	3	3[#]
PRACTICALS								
9.	EE3611	Power System Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**21**	**0**	**3**	**24**	**19.5**

*** Open Elective – I shall be chosen from the emerging technologies**
[&] Mandatory Course-II is a Non-credit Course (Student Shall select one course from the list given under MC-II)
 # NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

MANDATORY COURSES I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX3081	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	MX3082	Elements of Literature	MC	3	0	0	3	0
3.	MX3083	Film Appreciation	MC	3	0	0	3	0
4.	MX3084	Disaster Risk Reduction and Management	MC	3	0	0	3	0

MANDATORY COURSES II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX3085	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	3	0
2.	MX3086	History of Science and Technology in India	MC	3	0	0	3	0
3.	MX3087	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0
4.	MX3088	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	MX3089	Industrial Safety	MC	3	0	0	3	0

ELECTIVE - MANAGEMENT COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	GE3751	Principles of Management	HSMC	3	0	0	3	3
2.	GE3752	Total Quality Management	HSMC	3	0	0	3	3
3.	GE3753	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
4.	GE3754	Human Resource Management	HSMC	3	0	0	3	3
5.	GE3755	Knowledge Management	HSMC	3	0	0	3	3
6.	GE3792	Industrial Management	HSMC	3	0	0	3	3

VERTICAL III : EMBEDDED SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EE3016	Embedded System Design	PEC	2	0	2	4	3
2.	EE3017	Embedded C-programming	PEC	2	0	2	4	3
3.	EE3018	Embedded Processors	PEC	2	0	2	4	3
4.	EE3019	Embedded Control for Electric Drives	PEC	2	0	2	4	3
5.	EE3020	Smart System Automation	PEC	2	0	2	4	3
6.	EE3021	Embedded System for Automotive Applications	PEC	2	0	2	4	3
7.	EE3022	VLSI Design	PEC	2	0	2	4	3
8.	EE3023	MEMS and NEMS	PEC	2	0	2	4	3
9.	EE3024	Digital Signal Processing System Design	PEC	2	0	2	4	3

VERTICAL IV : ELECTRIC VEHICLE TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EE3025	Electric Vehicle Architecture	PEC	3	0	0	3	3
2.	EE3026	Design of Motor and Power Converters for Electric Vehicles	PEC	2	0	2	4	3
3.	EE3027	Electric Vehicle Design, Mechanics and Control	PEC	2	0	2	4	3
4.	EE3028	Design of Electric Vehicle Charging System	PEC	2	0	2	4	3
5.	EE3029	Testing of Electric Vehicles	PEC	2	0	2	4	3
6.	EE3030	Grid Integration of Electric Vehicles	PEC	3	0	0	3	3
7.	EE3031	Intelligent Control of Electric Vehicles	PEC	2	0	2	4	3

VERTICAL V : ADVANCED CONTROL

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CIC331	Process Modeling and Simulation	PEC	3	0	0	3	3
2.	CIC332	Computer Control of Processes	PEC	3	0	0	3	3
3.	CIC333	System Identification	PEC	3	0	0	3	3
4.	CIC336	Model Based Control	PEC	3	0	0	3	3
5.	CIC334	Non Linear Control	PEC	3	0	0	3	3
6.	CIC337	Optimal Control	PEC	3	0	0	3	3
7.	CIC335	Adaptive Control	PEC	3	0	0	3	3
8.	CIC338	Machine Monitoring System	PEC	3	0	0	3	3

VERTICAL VI - DIVERSIFIED COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EE3032	Energy Storage Systems	PEC	3	0	0	3	3
2.	EE3033	Hybrid Energy Technology	PEC	3	0	0	3	3
3.	EE3034	Design and Modeling of Renewable Energy Systems	PEC	3	0	0	3	3
4.	EE3035	Grid integrating Techniques and Challenges	PEC	2	0	2	4	3
5.	EE3036	Sustainable and Environmental Friendly HV Insulation System	PEC	3	0	0	3	3
6.	EE3037	Power System Transients	PEC	3	0	0	3	3
7.	CEI331	PLC Programming	PEC	3	0	0	3	3
8.	CCS334	Big Data Analytics	PEC	2	0	2	4	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPEN ELECTIVE I AND II

(EMERGING TECHNOLOGIES)

To be offered other than Faculty of Information and Communication Engineering

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OCS351	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2.	OCS352	IoT Concepts and Applications	OEC	2	0	2	4	3
3.	OCS353	Data Science Fundamentals	OEC	2	0	2	4	3
4.	CCS333	Augmented Reality /Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVES – III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OHS351	English for Competitive Examinations	OEC	3	0	0	3	3
2.	OMG352	NGOs and Sustainable Development	OEC	3	0	0	3	3
3.	OMG353	Democracy and Good Governance	OEC	3	0	0	3	3
4.	CME365	Renewable Energy Technologies	OEC	3	0	0	3	3
5.	OME354	Applied Design Thinking	OEC	3	0	0	3	3
6.	MF3003	Reverse Engineering	OEC	3	0	0	3	3
7.	OPR351	Sustainable Manufacturing	OEC	3	0	0	3	3
8.	AU3791	Electric and Hybrid Vehicles	OEC	3	0	0	3	3
9.	OAS352	Space Engineering	OEC	3	0	0	3	3
10.	OIM351	Industrial Management	OEC	3	0	0	3	3
11.	OIE354	Quality Engineering	OEC	3	0	0	3	3
12.	OSF351	Fire Safety Engineering	OEC	3	0	0	3	3
13.	OML351	Introduction to Non-Destructive Testing	OEC	3	0	0	3	3
14.	OMR351	Mechatronics	OEC	3	0	0	3	3
15.	ORA351	Foundation of Robotics	OEC	3	0	0	3	3
16.	OAE352	Fundamentals of Aeronautical Engineering	OEC	3	0	0	3	3
17.	OGI351	Remote Sensing Concepts	OEC	3	0	0	3	3
18.	OAI351	Urban Agriculture	OEC	3	0	0	3	3
19.	OEN351	Drinking Water Supply and Treatment	OEC	3	0	0	3	3

14. Mini Project 1: Simulation of complete closed loop control systems including sensor and actuator dynamics.
15. Mini Project 2: Demonstration of a closed loop system in hardware.

TOTAL :60 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will demonstrate the ability

CO1: To model and analyze simple physical systems and simulate the performance in analog and digital platform.
CO2: To design and implement simple controllers in standard forms.
CO3: To design compensators based on time and frequency domain specifications.
CO4: To design a complete closed control loop and evaluate its performance for simple physical systems.
CO5: To analyze the stability of a physical system in both continuous and discrete domains.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3
CO2	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3
CO3	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3
CO4	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3
CO5	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3
Avg	3	3	3	3	3	-	-	1.5	-	-	-	2	3	3	3

EE3601 PROTECTION AND SWITCHGEAR

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the significance of protection, protection schemes and role of earthing.
- To study the characteristics, functions and application areas of various relays.
- To acquire practical knowledge about common faults in power system apparatus and applying suitable protective schemes.
- To understand the functioning of static relays and Numerical protection concepts.
- To understand the problems associated with circuit breaking and to discuss about various circuit breakers.

UNIT I PROTECTION SCHEMES **9**

Significance and need for protective schemes – nature and causes of faults – types of faults Effects of faults - Zones of protection and essential qualities of protection – Types of Protection schemes - Power system Grounding and Methods of Grounding.

UNIT II BASICS OF RELAYS 9

Operating principles of relays –Universal torque equation - R-X diagram –Electromagnetic Relays – Over current, Directional and non-directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III OVERVIEW OF EQUIPMENT PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, and distantce protection of transmission lines.

UNIT V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption – DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - current chopping - interruption of capacitive current - resistance switching - Types of circuit breakers – air blast, oil, SF6 and vacuum circuit breakers – comparison of different circuit breakers – HVDC Breaker.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon the successful completion of the course, students will have theability to:

CO1: Understand and select proper protective scheme and type of earthing.
CO2: Explain the operating principles of various relays.
CO3: Suggest suitable protective scheme for the protection of various power system apparatus.
CO4: Analyze the importance of static relays and numerical relays in power system protection.
CO5: Summarize the merits and demerits and application areas of various circuit breakers.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, Four Edition, 2010.
2. Badri Ram ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age International Pvt Ltd Publishers, Second Edition 2011.
3. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., Second Edition, 2018.
4. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2018.

REFERENCES

1. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition,Prentice Hall of India Pvt. Ltd., New Delhi, 2013.
2. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2018
3. VK Metha," Principles of Power Systems", S. Chand, Reprint, 2013
4. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani,'Protection and Switchgear' Oxford University Press, 2nd Edition 2018.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	2	1	1	1	1	2	-	3	1	-
CO2	3	1	1	2	1	2	1	1	1	1	2	-	3	1	-
CO3	3	1	1	2	1	2	1	1	1	1	2	-	3	2	-
CO4	3	1	1	2	1	2	1	1	1	1	2	-	3	2	1
CO5	3	1	1	2	2	2	1	1	1	1	2	-	3	1	1
Avg.	3	1	1	2	1.2	2	1	1	1	1	2	-	3	1.4	1

EE3602 **POWER SYSTEM OPERATION AND CONTROL** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on,

- The significance of power system operation and control.
- Real power– frequency interaction and design of power– frequency controller.
- Reactive power– voltage interaction and the compensators for maintaining the voltage profile.
- The generation scheduling and economic operation of power system.

- SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION **9**

Power scenario in Indian grid – National and Regional load dispatching centres – Requirements of good power system – Necessity of voltage and frequency regulation – real power vs frequency and reactive power vs voltage control loops - System load variation, load curves – Load forecasting – Computational methods in load forecasting – Load shedding and Islanding – deregulation - Basics of electrical energy tariff.

UNIT II REAL POWER FREQUENCY CONTROL **9**

Basics of speed governing mechanisms and modelling – Speed regulation of two generators in parallel Load Frequency Control (LFC) of single area system – Static and dynamic analysis – LFC of two area system –Tie line modelling – Block diagram representation of two area system – Static and dynamic analysis – Tie line with frequency bias control – State variable model – Integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL **9**

Generation and absorption of reactive power – Basics of reactive power control – Automatic Voltage Regulator (AVR) – Brushless AC excitation system – Block diagram representation of AVR loop static and dynamic analysis – Stability compensation – Voltage drop in transmission line – Methods of reactive power injection – Tap changing transformer, SVC and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM **9**

Statement of economic dispatch problem – Input and output characteristics of thermal plant incremental cost curve – Optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) – Lambda–iteration method – Base point and participation factors method. Statement of Unit Commitment (UC) problem – Constraints on UC problem – Solution of UC problem using priority list – Special aspects of short term and long-term hydrothermal scheduling problems.

UNIT V COMPUTER AIDED CONTROL OF POWER SYSTEM **9**

Need of computer control of power system – Concept of energy control centers and functions – PMU system monitoring, Data acquisition and controls – System hardware configurations – SCADA and EMS functions – State estimation – Measurements and errors – Weighted least square estimation – Various operating states – State transition diagram.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO1: Understand the day – to – day operation of power system.
CO2: Model and analyse the control actions that are implemented to meet the minute-to-minute variation of system real power demand.
CO3: Model and analyze the compensators for reactive power control and various devices used for voltage control.
CO4: Prepare day ahead and real time economic generation scheduling.
CO5: Understand the necessity of computer control of power systems.

TEXTBOOKS:

NX3651	(ARMY WING) NCC Credit Course Level - III	L	T	P	C
		3	0	0	3

1. Olle. I. Elgerd, 'Electric Energy Systems theory – An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 2nd edition, 2017.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 3rd edition, 2013.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Fourth Edition, 2018.

REFERENCE BOOKS:

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw– Hill Education, Second Edition, Reprint 2018.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 23rd reprint, 2015.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 12th reprint, 2015.
4. B.M. Weedy, B.J. Cory et al, 'Electric Power systems', Wiley, Fifth Edition, 2012.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	1	-	-	-	2	3	3	3
CO2	3	2	1	1	-	1	-	2	-	2	-	2	3	3	3
CO3	3	2	1	1	-	1	-	2	-	2	-	2	3	3	3
CO4	3	2	1	1	-	1	-	2	-	2	-	2	3	1	2.33
CO5	2	1	-	-	-	-	-	1	-	2	-	2	3	3	3
Avg.	2	1.6	1	1	-	1	-	1.6	-	2	-	2	3	2.2	2.86

NCC Credit Course Level 3*

PERSONALITY DEVELOPMENT		**9**
PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4

BORDER & COASTAL AREAS					**4**
NX3652	**(NAVAL WING) NCC Credit Course Level - III**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
BCA 2	Security Setup and Border/Coastal management in the area				2
BCA 3	Security Challenges & Role of cadets in Border management				2
ARMED FORCES					**3**
AF 2	Modes of Entry to Army, CAPF, Police				3
COMMUNICATION					**3**
C 1	Introduction to Communication & Latest Trends				3
INFANTRY					**3**
INF 1	Organisation of Infantry Battalion & its weapons				3
MILITARY HISTORY					**23**
MH 1	Biographies of Renowned Generals				4
MH 2	War Heroes - PVC Awardees				4
MH 3	Study of Battles - Indo Pak War 1965, 1971 & Kargil				9
MH 4	War Movies				6

TOTAL: 45 PERIODS

NCC Credit Course Level 3*

PERSONALITY DEVELOPMENT		**9**
PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4

BORDER & COASTAL AREAS		**4**
BCA 2	Security Setup and Border/Coastal management in the area	2

NX3653	**(AIR FORCE WING) NCC Credit Course Level - III**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

BCA 3	Security Challenges & Role of cadets in Border management	2
NAVAL ORIENTATION		**6**
NO 3	Modes of Entry - IN, ICG, Merchant Navy	3
AF 2	Naval Expeditions & Campaigns	3
NAVAL COMMUNICATION		**2**
NC 1	Introduction to Naval Communications	1
NC 2	Semaphore	1
NAVIGATION		**2**
N 1	Navigation of Ship - Basic Requirements	1
N 2	Chart Work	1
SEAMANSHIP		**15**
MH 1	Introduction to Anchor Work	2
MH 2	Rigging Capsule	6
MH 3	Boatwork - Parts of Boat	2
MH 4	Boat Pulling Instructions	2
MH 5	Whaler Sailing Instructions	3
FIRE FIGHTING FLOODING & DAMAGE CONTROL		**4**
FFDC 1	Fire Fighting	2
FFDC 2	Damage Control	2
SHIP MODELLING		**3**
SM	Ship Modelling Capsule	3

TOTAL : 45 PERIODS

NCC Credit Course Level 3*

PERSONALITY DEVELOPMENT		**9**
PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4

BORDER & COASTAL AREAS		**4**
BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2
AIRMANSHIP		**1**
A 1	Airmanship	1
BASIC FLIGHT INSTRUMENTS		**3**
FI 1	Basic Flight Instruments	3
AERO MODELLING		**3**
AM 1	Aero Modelling Capsule	3
GENERAL SERVICE KNOWLEDGE		**2**
GSK 4	Latest Trends & Acquisitions	2
AIR CAMPAIGNS		**6**
AC 1	Air Campaigns	6
PRINCIPLES OF FLIGHT		**6**
PF 1	Principles of Flight	3
PF 2	Forces acting on Aircraft	3
NAVIGATION		**5**
NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3
AERO ENGINES		**6**
E 1	Introduction and types of Aero Engine	3
E 2	Aircraft Controls	3

TOTAL : 45 PERIODS

EE3611 POWER SYSTEM LABORATORY

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

1 To provide a better understanding of modelling of transmission lines in impedance and admittance forms.
2 To apply iterative techniques for power flow analysis and to carry out short circuit and stability studies on power system.
3 To analyze the load – frequency and voltage controls.
4 To analyze optimal dispatch of generators and perform state estimation.

5 To understand the operation of relays, characteristics, and applications.

LIST OF EXPERIMENTS:

1 Computation and modelling of transmission Lines.
2 Formation of Bus Admittance and Impedance Matrices.
3 Power Flow Analysis Using Gauss-Seidel Method.
4 Power Flow Analysis Using Newton Raphson Method.
5 Symmetric and Unsymmetrical Fault Analysis.
6 Transient Stability Analysis of SMIB System.
7 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems.
8 Economic Dispatch in Power Systems.
9 State estimation: Weighted least square estimation.
10 Performance analysis of over current relay.
11 Performance analysis of impedance relay.
12 Testing of CT, PT, and Insulator string.
13 Relay Coordination in Radial Feeder Protection Scheme.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the successful completion of the laboratory, students will be able to:
CO1: Model and analyze the performance of the transmission lines.
CO2: Perform power flow, short circuit, and stability analysis for any power system network.
CO3: Understand, design, and analyze the load frequency control mechanism.
CO4: Perform optimal scheduling of generators and compute the state of the power system.
CO5: Understand, analyze, and apply the relays for power system protection.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	2	1	2	-	3	3	3	3
CO2	3	3	2	2	3	-	-	2	1	2	-	3	3	3	3
CO3	3	3	2	2	3	-	-	2	1	2	-	3	3	3	3
CO4	3	3	2	2	3	-	-	2	1	2	-	3	3	3	3
CO5	3	3	2	2	3	-	-	2	1	2	-	3	3	3	3