Annasaheb Dange College of Engineering and Technology, Ashta

Department of Electrical Engineering

Teaching and Evaluation Scheme

Final Year. B. Tech, Semester VII

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE+ ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
2EEPC401	Electrical Drives	3	0	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
2EE**4##	Minor Course - IV	3	0	0	3	40	16	30	30	24	100	-	-	-	-	-	-	-	100
2EEPE4##	Professional Elective - II	3	0	0	3	40	16	30	30	24	100	-	-	-	-	-	-	-	100
2EEPC408	Industrial Automation and SCADA	3	0	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
2ILOE4**	Open Elective - III	2	0	0	2	100	40	-	-	-	100	40	-	-	-	-	-	-	100
2EEHS409	Project Management and Finance	2	0	0	2	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2EEEL410	Project Work	0	0	8	4	-	-	-	-	-	-	-	50	20	50	20	100	40	100
2EEVS411	Renewable Energy Systems Simulation Lab	0	0	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
Total		**16**	**0**	**14**	**23**														**900**
Total Contact Hours		**30**																	

Professional Elective - II[&]

Track	Course Code	Course Name
Power Engineering	2EEPE404	Utilization and Conservation of Electrical Energy
Control Engineering	2EEPE405	Special Electrical Machines
Embedded System	2EEPE406	Smartgrid
E Mobility	2EEPE407	Battery Management System

& Students are permitted to choose all the professional electives from particular track or from different track

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Annasaheb Dange College of Engineering and Technology, Ashta

Department of Electrical Engineering

Teaching and Evaluation Scheme

Final Year B. Tech, Semester VIII

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE+ ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
2EEPE412	Professional Elective - III (MOOC) [+]	2	0	0	2	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2EEPE413	Professional Elective - IV (MOOC) [+]	2	0	0	2	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2EE**414	Minor Project	0	0	0	3	-	-	-	-	-	-	-	100	-	-	-	100	40	100
2EEEL415	Internship	0	0	20	10	-	-	-	-	-	-	-	100	-	-	-	100	40	100
		4	**0**	**20**	**17**														**400**
	Total Contact Hours	**4 + Internship**																	
+	Based on the availability of the course at the time of offering BoS Chairman & Course Chairman will decide on the course upon student option																		

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Class			Final Year B. Tech. Semester - VII
Course Code and Course Title			**2EEPC401 - Electrical Drives**
Prerequisite/s			2EEPC210, 2EEPC302, 2EEPC310
Teaching Scheme: Lecture/Tutorial/Practical			03/00 /02
Credits			04
Evaluation Scheme	**T**	**ISE / MSE / ESE**	40/30/30
	P	**ISE / ESE**	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to,	
2EEPC401_1	**Explain** the principles of electrical drive system, components, types, multi-quadrant dynamics.
2EEPC401 _2	**Perform** the controlled converter fed DC motor drives including their respective electrical braking methods.
2EEPC401_3	**Implement** control strategies for special-purpose motor drives in industrial applications
2EEPC401_4	**Distinguish** the operation and control strategies of one quadrant, two quadrant and four quadrant chopper fed DC motor drives
2EEPC401_5	**Investigate** the methods of stator and rotor side speed control in induction motor drives.

Unit	Course contents	Hours
1	**Fundamental of Electrical Drives** Block diagram of electrical drive, Types of electrical drives, Equivalent values of drive parameters, Speed-torque conventions in multi quadrant dynamics: acceleration, deceleration, starting and stopping, classification of load torques and their characteristics, choice of electrical drives, steady state stability.	7
2	**Converter fed DC motor Drives** Classification of electric braking, Single phase half and fully controlled converter fed DC motor, Three phase half and fully controlled converter fed DC motor, Supply harmonics, Power factor and ripples in motor current, Single phase dual converter fed DC drive, Closed loop control of converter fed DC drive.	7
3	**Chopper fed DC motor Drives** Chopper operation and principle, Control strategy, Configurations of chopper fed DC drives (one quadrant, two quadrants and four quadrant choppers), Closed loop control of chopper fed DC drive.	6
4	**Induction Motor Drives** Stator voltage control, Energy efficient drive, V/F control, Field weakening mode, Vector control strategies, AC voltage controller fed induction motor drive, Closed loop control of AC drive, Voltage source inverter fed induction motor drive, Rotor resistance control using power converter, Concept of slip power recovery - Static Kramer drive and Static Scherbius drive.	8
5	**Special Motor Drives** Construction, working and characteristics: Switched reluctance motor drive, Brushless direct current motor drive, Permanent magnet synchronous motor drive, Universal motor drive	5

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

6	**Drives for Industrial Application** Battery powered drives for vehicles, Traction drives, Servo motor based motion control in smart agricultural robots, Stepper motors based automated conveyor systems, Challenges in industrial drive –Protection and electromagnetic inference.	6

List of experiments

Expt. No.	Title of Experiment
1	Four quadrant operation of DC electrical drive
2	Modes of operation and braking of DC drive
3	Single phase half-controlled converter fed DC drive
4	Single phase fully controlled converter fed DC drive
5	Three phase half and fully controlled converter fed DC drive
6	Chopper controlled DC series motor drive
7	Chopper controlled DC shunt motor drive
8	Speed control of three phase induction motor drive using V/F method
9	Simulation of single-phase half and fully controlled converters fed DC drives
10	Simulation of three-phase half and fully controlled converters fed DC drives
11	Simulation of one quadrant (Class A & Class B) chopper fed DC drives
12	Simulation of VSI fed induction motor drive
13	Simulation of three phase slip ring induction motor drive using rotor resistance control
14	Simulation of three phase slip ring induction motor drive using slip power recovery model

Minimum **ten** experiments should be performed from the above list.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of electrical drives	G K Dubey	CRC Press	Second	2017
02	Electrical drives	NK De, PK Sen	PHI Delhi	Third	2011
03	Electrical drives concepts and applications	Vedam Subrahmanyam	McGraw- Hill	Second	2016

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power Electronics: Converters, Applications and design	Ned Mohan	Wiley Publication	Third	2009
02	Power electronics & Variable frequency drives technology and applications	Dr.B.K. Bose	Wiley Publication	First	2022
03	Power Electronic Design: A Practitioners Guide	Keith H.Sueker	Elsevier Publication	First	2022

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Minor Course – IV, Track I: Electric Vehicle			
Class			Final Year B. Tech. Semester-VII
Course Code and Course Title			**2EEEV402, Plug in Electric Vehicles in Smart grid**
Prerequisite/s			2EEPE315, 2EEEV304, 2EEEV316
Teaching Scheme: Lecture/Tutorial/Practical			03/00/00
Credits			03
Evaluation Scheme	**T**	**ISE/MSE/ESE**	40/30/30

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EEEV402_1	**Explain** the architecture of Plug-in Electric Vehicle, charging infrastructure and grid issues
2EEEV402_2	**Analyze** the operation and challenges of conductive chargers and wireless chargers
2EEEV402_3	**Categorize** the possibilities from EVs for frequency and voltage support in grid
2EEEV402_4	**Correlate** the integration of EV and smart grid with distributed energy resources.
2EEEV402_5	**Apply** the concepts of centralized and decentralized charging schemes.

Syllabus

Unit	Contents	Hours
1	**Plug-In Electric Vehicle Technologies** PEV Technologies, PEV Systems, impacts in distribution power network, Technical Issues in EV battery and charging, Smart Charging Infrastructure, Integration of PEVs to Electric Grid, Types of Incentives	7
2	**Integrated Battery Chargers for Electric Vehicles** Introduction, Classifications of chargers, Integrated charging system, Assessment of existing integrated charging circuits, Working of integrated converter, Design of the battery-charging converter, Control strategy and result analysis, Power Quality control for battery charger	6
3	**Wireless Chargers for Electric Vehicles** Introduction, Inductive wireless power transfer, Modelling of coils, types of coils, Compensation networks, Power transfer and efficiency, Standards of wireless power charging	6
4	**Smart Grid Using PEV's** The Smart Grid and Microgrid, Impact of PEVs on Distributed Energy Resources in the Smart Grid, V2G Technology and PEVs Charging Infrastructures, Impact of Estimated EVs on Electrical Network, Standardization & Plug-and-Play	7
5	**Distributed Energy Resource With PEV** Introduction, Distributed Energy Sources in smart grid: Solar, Wind, Fuel Cells, Electric vehicles, Backup Power Supplies, MPPT Strategies for PV Based Microgrids, Microgrid Topologies	7

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

6	**EV Charging Facility Planning** Energy generation scheduling, different power sources, fluctuant electricity, centralized charging schemes, decentralized charging schemes, energy storage integration into Microgrid, Design of V2G Aggregator	6

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Plug In Electric Vehicles in Smart Grids, Integration Techniques	Sumedha Rajakaruna Farhad Shahnia Arindam Ghosh	Springer	First	2015
2	Plug In Electric Vehicles in Smart Grids, Energy Management	Sumedha Rajakaruna Farhad Shahnia Arindam Ghosh	Springer	First	2015
3	Vehicle-to-Grid: Linking Electric Vehicles to the Smart Grid	Junwei Lu and Jahangir Hossain	The IET	First	2015
4	Electric Vehicle Components and Charging Technologies	Sanjeev Singh, Sanjay Gairola and Sanjeet Dwivedi	The IET	First	2023

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles,	M. Ehsani, Y. Gao, S. Longo, K. Ebrahim,	CRC Press	Third	2018
2	Electric and Hybrid Vehicles: Design Fundamentals	Husain	CRC Press	Second	2010
3	Intelligent Control of Connected Plug-in Hybrid Electric Vehicles	Amir Taghavipour Mahyar Vajedi Nasser L. Azad	Springer	First	2019
4	Technologies and Applications for Smart Charging of Electric and Plug-in Hybrid Vehicles	Ottorino Veneri	Springer	First	2017

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Minor Course – IV, Track II: Control Engineering		
Class		Final year B. Tech. Semester – VII
Course Code and Course Title		**2EECE403, Industrial Automation**
Prerequisite/s		2EECE214, 2EECE305, 2EECE317
Teaching Scheme: Lecture/Tutorial/Practical		03/00/00
Credits		03
Evaluation Scheme	**ISE/MSE/ESE**	40/30/30

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EECE403_1	**Explain** the evolution, necessity, and architecture of industrial automation.
2EECE403_2	**Illustrate** the architecture and functional modes of PLCs with basic programming structures.
2EECE403_3	**Configure** PLC systems with electrical control panels for advanced industrial automation.
2EECE403_4	**Analyze** the use of PLC programming techniques for industrial processes.
2EECE403_5	**Apply** SCADA system features for Industrial automation.

Unit	Contents	Hours
1	**Introduction to Industrial Automation** Definition of Industrial Process, Meaning of Automation and Control, Necessity and Evolution of Automation, Architecture of Industrial Automation Network, Types of Automation Systems, Process Automation with Smart and Intelligent Instruments, Industry 1.0 to Industry 5.0.	6
2	**Fundamentals of Programmable Logic Controller (PLC)** PLCs: Invention, Definition, Architecture of PLC, Classifications, Sustainability and its Features, Role of PLC in Process Automation, Input output modules and Its Devices, Major PLC Vendors and their Products, PLC installation, Trouble shooting and maintenance.	6
3	**PLC Programming** Analog and digital Input output signals, Variables and Data Types, Register, Timer, Counter, Arithmetic Function, Advanced PLC Functions, Data Handling Functions, PID Control with PLC, Logic Development using ladder diagram for industrial applications, Case study.	8
4	**Electrical Control Panel** Electrical control panel drawing and its types, Components used in electrical panels, Panel testing, Cold and hot testing, Trouble shooting and maintenance, Project life cycle, Examples of industrial processes with PLC.	6
5	**Supervisory Control and Data Acquisition System** Definitions and history of Supervisory Control and Data Acquisition, Typical SCADA system Architecture, Communication requirements, Desirable	7

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

	Properties of SCADA system, Features, Advantages and disadvantages, Applications of SCADA, Open systems interconnection model.	
6	**Elements of SCADA** Master Terminal Unit, Remote Terminal Unit – Topology, Requisites, Hardware and Functionality, Software Functions, Operation, Field Data Devices and Interfacing, Human Machine Interface, Human Computer Interface, Data Historian, Alarm Handling.	6

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year
1	Industrial Automation Technologies	Chanchal Dey, Sunit Kumar Sen	CRC Press	First	2020
2	Programmable Logic Controllers	W. Bolton	ELSEVIER	Fourth	2006
3	PLCS & SCADA Theory and Practice	Rajesh Mehra, Vikrant Vij	University Science Press	---	2011
4	Industrial Automation Using PLC SCADA & DCS	R.G.Jamka	Global Education Limited	Second	2018

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year
1	Introduction to Industrial Automation	Stamatios Manesis	CRC Press	First	2018
2	Programmable Logic Controllers: Principles and Applications	John W. Webb, Ronald A. Reis	Pearson India	Fifth	2015
3	Industrial Automation Handbook	Frank Lamb	McGraw-Hill Education	---	2013

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's
Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute
Department of Electrical Engineering

Professional Elective II, Track I: Power Engineering		
Class		Final Year B. Tech. Semester - VII
Course Code and Course Title		**2EEPE404, Utilization and Conservation of Electrical Energy.**
Prerequisite/s		2EEPC210, 2EEPC212, 2EEPC302, 2EEPC310
Teaching Scheme: Lecture/Tutorial/Practical		03/00/00
Credits		03
Evaluation Scheme	**ISE/MSE/ESE**	40/30/30

Course Outcomes (COs):
After successful completion of this course, the student will be able to:

2EEPE404_1	**Use** principles of illumination to design effective lighting systems.
2EEPE404_2	**Identify** various electric heating and welding methods, their advantages and equipment used in different applications.
2EEPE404_3	**Explain** the working principles, components, and troubleshooting of refrigeration and air conditioning systems.
2EEPE404_4	**Describe** principles of traction systems and train mechanics to analyze and evaluate different motor applications in transportation.
2EEPE404_5	**Develop** the plan for energy audit in specific industry using appropriate methodologies.

Unit	Contents	Hours
1	**Illumination Engineering** Nature of light, Visibility spectrum curve of relative sensitivity of human eye and wave length of light, Terms used in illumination, Laws of illumination, Different type of lamps, types of lighting systems, Design of illumination system, Lighting scheme, Energy efficient lamps	8
2	**Electric Heating** Advantages of Electric Heating, Modes of heat transfer, Classification of electrical heating methods, Resistance heating, Arc furnaces, Induction heating, Dielectric Heating, High Frequency eddy current heating.	6
3	**Electric Welding** Advantages of electric welding, Resistance welding, Arc welding, Power supply of Resistance and arc welding, Electrical welding equipment, Comparison between Resistance and arc welding	5
4	**Refrigeration and Air Conditioning** Refrigeration system –Types of refrigerants Domestic refrigerator, Water coolers, Air conditioning systems, Air conditioning cycle, Classification of air conditioning systems, Central system, Unitary systems, Load estimation, Heating of building.	7

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

5	**Electric Traction** Review of existing electric traction systems in India, Advantages of electrical traction, Different systems of electric tractions, Train movement and energy consumption, Types of traction motors, Traction Motor control, Track equipment and collection gear, Mechanics of train movement, Speed-time curves for different services.	7
6	**Electrical Energy Audit** Benefits and procedure for energy audit, Instruments for energy audit, Methodology, Case study.	6

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Utilization Electric power and Electric Traction	J. B. Gupta	S. K. Kataria and Sons	Second	2000
2	Art and Science of Utilisation of Electrical Energy	H. Partab,	Dhanpat Rai and Co. New Delhi	Second	2015
3	A course in electrical power	Soni, Gupta and batnagar	Dhanpat Rai	Ninth	1987
4	Utilization of electrical Energy	Openshaw Taylor	Orient blockswan	First	2006

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Generation, Distribution and Utilization of Electrical Energy	C L Wadhwa	New Age International (P) limited	First	2004
2	Electrical Drives: Concept and applications	Vedam Subrahmanyam	THM	Frist	1999
3	A Text book of electrical Power	Dr. S. L. Uappal	Khanna Publication	Eighth	2017
4	Energy Conservation And Audit	M A Choudhari	Wiley	Frist	2000

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Professional Elective II, Track II: Control Engineering			
Class			Final year B. Tech. Semester - VII
Course Code and Course Title			**2EEPE405, Special Electrical Machines**
Prerequisite/s			2EEPC210, 2EEPC302, 2EEPC310
Teaching Scheme: Lecture/Tutorial/Practical			03/00/00
Credits			03
Evaluation Scheme	**T**	**ISE / MSE / ESE**	40/30/30

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EEPE405_1	**Demonstrate** the performance characteristics of special electrical machines
2EEPE405_2	**Analyze** the control strategies and operating modes of special electrical machines
2EEPE405_3	**Investigate** the design considerations of special electrical machines
2EEPE405_4	**Identify** industrial and household applications of special electrical machines
2EEPE405_5	**Apply** recent power electronic control techniques in the field of special electrical machines.

Unit	**Course Contents**	**Hours**
1	**Permanent Magnet Synchronous Machines** Definition and importance, Difference between conventional and special machines, Construction, working principle and types, Industrial and household applications, Mathematical Modelling of PMSM: d-q axis theory, voltage and torque equations, Control Techniques: Vector control, Field-oriented control, Power factor and efficiency optimization.	**7**
2	**Stepper Motors** Introduction to Stepper Motors, Construction, types, and working principles (Variable reluctance, permanent magnet, hybrid), Operating Modes: Full step, half step, and micro-stepping, Drive Techniques: Open-loop and closed-loop control of stepper motors, Applications.	**7**
3	**Switched Reluctance Motors** SRM Fundamentals: Construction, operating principles, and rotor position sensing, Performance Characteristics: Torque production, speed-torque curves and efficiency, Control Methods: Voltage control, Current control and torque ripple minimization, Applications.	**6**
4	**Brushless DC Motors** Introduction to BLDC Motors: Construction, types, Operating Principles: Electronic commutation and performance characteristics Mathematical Modeling and Control: PWM control, Drive circuits for BLDC motors, Applications.	**6**

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

5	**Linear Machines** Linear Induction Machines (LIM): Principle of operation, construction and performance. Linear Synchronous Machines (LSM): Principle of operation, construction, Types and control methods. Design Considerations: Efficiency and power factor improvement Applications: Maglev trains, conveyor systems and elevators	**7**
6	**Recent Advances and Applications of Special Electrical Machines** Recent Innovations: New materials, advancements in machine design, and control techniques, Smart Applications. Modelling and Simulation: Introduction to simulation tools for analysing special electrical machines	**6**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year
1	Electric Machinery	Bimbhra P.S	Khanna Publisher	Seventh	2021
2	Electric machines	Ashfaq Husain	Dhanpatrai and Co.	Third	2024
3	Electric Machinery	A.E Fitzgerald Stephen Kingsly	Tata Mcgraw Hill	Seventh	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year
1	Electric Machines	Kothari D.P Nagrath I.J	THM Publications	Fifth	2017
2	Principles of Electric Machines and Power Electronics	P. C. Sen	Wiley	Third	2013
3	Special Electrical Machines	K. Venkataratnam	Universities Press	First	2008
4	Switched Reluctance Motor Drives: Modeling, Simulation, Analysis, Design, and Applications	R. Krishnan	CRC Press	First	2001

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Professional Elective II, Track III: Embedded Systems			
Class			Final Year B. Tech. Semester - VII
Course Code and Course Title			**2EEPE406, Smart Grid**
Prerequisite/s			2EEPC212, 2EEPC303
Teaching Scheme: Lecture/Tutorial/Practical			03/00/00
Credits			03
Evaluation Scheme:	**T**	**ISE / MSE / ESE**	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
2EEPE406_1	**Discuss** the importance of smart grids, including their need, opportunities, and challenges.
2EEPE406_2	**Explain** smart metering devices to enhance transparency, efficiency, and sustainability in energy consumption through their associated technologies
2EEPE406_3	**Analyze** the impact of smart grid technologies on transmission and distribution systems.
2EEPE406_4	**Utilize** strategies to address the operational, control and protection challenges in microgrid systems
2EEPE406_5	**Apply** power quality management techniques in the smart grid to enhance reliability and ensure compliance with regulatory standards

Unit	**Course Contents**	**Hours**
1	**Introduction to Smart Grid** Concept, Definitions & need, Difference between conventional grid and smart grid, Opportunities & challenges in smart grid, National and International Initiatives in Smart Grid.	**5**
2	**Smart Metering** Introduction to Advanced Metering Infrastructure (AMI), Drivers and benefits, AMI protocols, Standards and initiatives, AMI needs in the smart grid, Real time management and control, Phasor Measurement Unit (PMU).	**7**
3	**Smart Grid Technologies in Transmission System** Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: Energy Management System, Wide area monitoring, Protection and control.	**7**
4	**Smart Grid Technologies in Distribution System** Distribution Management System, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Impact of electric vehicles charging on smart grid.	**6**
5	**Microgrids** Integration of distributed energy sources, Hybrid power system, Microgrid Concept, Layout, Advantages and challenges in Microgrid system,	**7**

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

	Interconnection issues, AC and DC Microgrid, Comparison, Operation, Control and Protection Issues of Microgrid	
6	**Power Quality Management in Smart Grid** Power Quality & Electromagnetic Compatibility in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.	7

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year
1	Smart Grids Advanced Technologies and Solutions	Stuart Borlase	CRC	Second	2018
2	Smart Grid: Technology and Applications	Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins	Wiley	First	2012
3	The Advanced Smart Grid: Edge Power Driving Sustainability	Andres Carvallo, John Cooper	Artech House	Second	2015

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Big data analytics in future power systems	Ahmed F. Zobaa, Trevor J. Bihl,	CRC press	First	2018
2	Smart Grid: Fundamentals of Design and Analysis	James Momoh	A John Wiley & Sons, Inc. Publication	First	2012
3	Integration of Green and Renewable Energy in Electric Power Systems	Ali Keyhani, Mohammad N. Marwali, Min Dai	Wiley	--	2009

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Professional Elective II, Track IV: E Mobility			
Class			Final Year B. Tech. Semester - VII
Course Code and Course Title			**2EEPE407, Battery Management System**
Prerequisite/s			2EEPE315
Teaching Scheme: Lecture/Tutorial/Practical			03/00/00
Credits			03
Evaluation Scheme	**T**	**ISE/MSE/ESE**	40/30/30

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EEPE407_1	**Explain** the constructional aspects of electric vehicle batteries.
2EEPE407_2	**Describe** the battery characteristics and operating parameters relevant to electric vehicle and battery modelling for simulation studies.
2EEPE407_3	**Identify** the suitable battery management system for a particular electric vehicle battery pack.
2EEPE407_4	**Design** electric vehicle chargers and provide report on charging infrastructures.
2EEPE407_5	**Analyze** the suitable second use applications of electric vehicle battery and recycling methods.

Unit	**Contents**	**Hours**
1	**Electric Vehicle Batteries** Lead Acid Batteries, Special characteristics of lead acid batteries, Battery life and maintenance, Battery charging, Nickel-based Batteries, Nickel cadmium, Nickel metal hydride batteries, Sodium-based Batteries, Sodium sulphur batteries, Sodium metal chloride (Zebra) batteries, Lithium Batteries, The lithium polymer battery, The lithium-ion battery, Metal Air Batteries, The aluminium air battery, The zinc air battery	**7**
2	**Battery Characteristics and Parameters** Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries, Electrical parameters- Heat generation- Battery design, Performance criteria for Electric vehicles batteries- Vehicle propulsion factors, Power and energy requirements of batteries- Meeting battery performance criteria, setting new targets for battery performance	**6**
3	**Battery Modelling** General approach to modelling batteries, simulation model of a rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of the NiCd battery model, Simulation examples.	**6**
4	**Battery Pack and Battery Management System** Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal	**7**

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

	management system, Battery Management System: Definition, Parts: Power Module, Battery Standards & Tests.	
5	**Electric Vehicle Charging** **Battery Chargers:** Charge equalization, Conductive (Basic charger circuits, Microprocessor based charger circuit. Arrangement of an off-board conductive charger, Standard power levels of conductive chargers, Inductive charging, Battery indication methods **Charging Infrastructure:** Domestic Charging Infrastructure, Public Charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.	7
6	**Battery Recycling** Battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, Short circuits, charging and discharging. Environment and Human Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries.	6

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year
1	Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Hussein	CRC Press	2nd	2003.
2	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	CRC Press	1st	2004
3	Electric Vehicle Technology Explained	James Larminie, John Lowry	Wiley	1st	2003
4	Used Battery Collection and Recycling	G. Pistoia, J.P. Wiaux, S.P. Wolsky	Elsevier	1st	2001

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year
1	Reuse and Recycling of Lithium-Ion Power Batteries	Guangjin Zhao	John Wiley & Sons	4th	2017
2	Battery Reference Book	T R Crompton	Newnes- Reed Educational	3rd	2018
3	Thermal Management of Electric Vehicle Battery Systems	Ibrahim Dinçer, Halil S. Hamut i	JohnWiley& Sons	3rd	2016
4	Recycling of Lithium-Ion Batteries: The LithoRec Way	Arno Kwade, Jan Diekmann	Springer	2nd	2018

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Class			Final Year B. Tech. Semester - VII
Course Code and Course Title			**2EEPC408, Industrial Automation & SCADA**
Prerequisite/s			2EEPC204
Teaching Scheme: Lecture/Tutorial/Practical			3/0/2
Credits			4
Evaluation Scheme	**T**	**ISE/MSE/ESE**	40/30/30
	P	**ISE/ESE**	50/0

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EEPC408_1	**Utilize** the SCADA system's features to monitor and control industrial processes effectively.
2EEPC408_2	**Configure** PLC systems with electrical control panels for advanced industrial automation solutions.
2EEPC408_3	**Demonstrate** DCS architectures, explaining their functionalities and assessing redundancy concepts.
2EEPC408_4	**Analyze** the principles and evolution of automation technologies to differentiate various industrial processes and automation methods.
2EEPC408_5	**Evaluate** PLC architectures and programming techniques for effective control system design and implementation.

Unit	Contents	Hours
1	**Fundamentals of Automation** Fundamentals of industrial automation, Definition and Goals of Automation, Need and role of automation, Evolution of automation, Types of processes, Types of Automation, Industry 1.0 to Industry 5.0.	5
2	**Programmable Logic Controller** Definition, overview of PLC systems, General PLC programming procedures, Programming on-off outputs, Basic PLC functions, Register basics, Timer functions, Counter functions, Arithmetic functions, PLC Advanced functions, PID functions, Alternate programming languages.	7
3	**Electrical Control Panel** Electrical control panel drawing and its types, Components used in electrical panels, Panel testing, Cold and hot testing, PLC installation, Trouble shooting and maintenance, Project life cycle, Examples of industrial processes with PLC.	7
4	**Supervisory Control and Data Acquisition systems** Definitions and history of Supervisory Control and Data Acquisition, Typical SCADA system Architecture, Communication requirements, Desirable Properties of SCADA system, Features, Advantages and disadvantages, Applications of SCADA. Open systems interconnection model, TCP/IP protocol, DNP3 protocol, Control and Information Protocol.	6

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

5	**Distributed Control Systems** Introduction of DCS, Different architectures, Building blocks, Detailed descriptions and functions of local control units, Basic elements & functions, Operator stations, Data highways, Redundancy concepts, Logic development for different applications using functional block diagram.	**7**
6	**Communication Facilities and Applications** DCS communication Facilities, Communication system requirements, Architectural issues, Protocol issues, Communication system standards, Operator interfaces, Low level and high-level operator interfaces, Operator Displays, Engineering interfaces, Applications of DCS, Case Study.	**7**

LIST OF EXPERIMENTS

Expt. No	Title of the Experiment
1.	Input and Output modules for PLC.
2.	Ladder diagram for basic and universal logic gates.
3.	Ladder diagram for different arithmetic operations.
4.	Ladder diagram for timing and counting applications.
5.	Ladder diagram for industrial process and control.
6.	Human Machine Interfacing with PLC.
7.	Configuring Screens, Graphics and Creating a Project and tags in SCADA.
8.	Simulation and Configuration of Redundant Controllers with Non-Redundant and Redundant Input Output Buses for AI, DI, AO, and DO Modules.
9.	Create analog tags in logic configuration for industrial process and control.
10.	Create digital tags in logic configuration for industrial process and control.
11.	Design and Simulation of Process Mimic with Alarms, Reports, and Trends in SCADA.
12.	Control Logic Configuration for Manual and Auto Operation with Push Buttons, Counter Display, and Upper/Lower Limits

Minimum **ten** experiments should be performed from the above list.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year**
1	Programmable Logic Controllers: Principles and Applications	John W. Webb, Ronald A. Reis	Prentice Hall	Fifth	2007
2	Programmable Logic Controllers: programming methods and applications.	John R. Hackworth	Pearson India	First	2008
3	SCADA: Supervisory Control and Data Acquisition	Stuart A. Boyer	ISA , International Society of Automation	First	2020
4	Distributed Control Systems: Principles and Applications	G. J. Hwang	Springer	First	2022

Reference Books:					
Sr. No.	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Programmable Controllers	Batten G L	McGraw Hill	Second	1989
2	Practical Modern SCADA Protocols	Gordan Clark	Elsevier	First	2004
3	SCADA Systems: Fundamentals and Applications	S. A. Shaikh, A. G. Khanna	PHI Learning	First	2023
4	Distributed Control Systems: A Practical Approach to DCS Design and Applications	S. V. L. Narasimham	Springer	First	2023

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Course Details:

Class	B.Tech., Sem - VII
Course Code and Course Name	**2EEHS409, Project Management and Finance**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme : ISE/MSE/ESE	40 / 30 / 30

Course Objectives:

1. To equip students with an understanding of the significance of economics and its related policies.
2. To empower students to manage professional tasks through knowledge of relevant procedures.
3. To inculcate an understanding of the importance of economics in the context of management.

Course Outcomes (CO's): After successful completion of this course, the student will be able to,

CO 1	Apply project management principles to initiate, plan, execute, monitor, and control projects.
CO 2	Analyze project feasibility considering technical, economic, and financial aspects.
CO 3	Estimate project costs, schedule tasks, and allocate resources effectively.
CO 4	Identify and mitigate project risks using appropriate techniques.
CO 5	Apply financial principles to project budgeting, cash flow management, and investment appraisal.
CO 6	Effectively communicate project plans, progress, and results to stakeholders.

Course Contents:

Unit 1	**Project Fundamentals**	**04**
Definition and characteristics of a project, Project life cycle and its phases, Project management methodologies (e.g., Agile, Waterfall, Scrum), Stakeholder analysis and management, Introduction to Project Management Professional (PMP) framework		
Unit 2	**Project Planning & Scheduling**	**04**
Work Breakdown Structure (WBS) development, Activity definition and sequencing, Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT), Resource allocation and leveling, Project scheduling tools (e.g., Gantt charts, MS Project)		
Unit 3	**Project Cost & Risk Management**	**05**

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Cost estimation techniques (e.g., Parametric, Analogous, Bottom-up), Cost budgeting and control, Earned Value Management (EVM), Cost-benefit analysis and return on investment (ROI), Risk identification and assessment, Qualitative and quantitative risk analysis technique, Risk response planning (mitigation, avoidance, transference, acceptance), Contingency planning and reserves		
Unit 4	**Project Execution and Control**	**04**
Activity Planning, Team Building and Management, Stakeholder Engagement, Project Monitoring & Control Performance Measurement, Change Management, Issue Resolution, Quality Management : Quality Planning, Quality Assurance, Continuous Improvement, Project Challenges and Solutions		
Unit 5	**Project Communication & Finance**	**04**
Communication planning and channels, Stakeholder communication strategies, Report writing and presentations, Conflict resolution and negotiation, Time value of money concepts, Capital budgeting techniques (e.g., NPV, IRR, Payback period), Sources of project finance (e.g., loans, equity, grants), Financial statement analysis for project evaluation		
Unit 6	**Project Closure & Review**	**05**
Project completion and handover, Project closure procedures, Post-project evaluation and lessons learned Project audits and reviews, Professional ethics and responsibilities in project management		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	A Guide to the Project Management Body of Knowledg	-	Project Management Institute (PMI)	7th	2021
2	Project Management: The Managerial Process	Erik W. Larson & Clifford F. Gray	McGraw Hill	6th	2017
3	Project Finance: In Theory and Practice	Stefano Gatt	Academic Press	-	2007

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Course Details:

Class	B.Tech., Sem - VII
Course Code and Course Name	**2EEEL410,Project Work**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	0/00/08
Credits	04
Evaluation Scheme : ISE/ESE	50/50

Course Objectives:

1. To define and plan a major engineering project.
2. To apply fundamental engineering principles to solve complex problems.
3. To conduct research, analyze data, and interpret results.
4. To develop and implement a project plan effectively.
5. To effectively communicate project goals, methodology, and outcomes through written and oral presentations.
6. To Demonstrate critical thinking, problem-solving, and design skills.
7. To gain experience in working independently and as part of a team.

Course Outcomes (CO's): After successful completion of this course, the student will be able to,

CO 1	Define and plan a major engineering project, considering feasibility, resources, and ethical implications.
CO 2	Apply fundamental engineering principles and relevant theories to solve complex engineering problems within the project scope.
CO 3	Conduct thorough research, analyze data effectively, and interpret results to inform project decisions and optimize solutions.
CO 4	Develop and implement a comprehensive project plan, including timelines, budgets, risk management strategies, and quality control measures.
CO 5	Communicate project goals, methodology, and outcomes effectively through written reports, presentations, and technical documentation.
CO 6	Demonstrate critical thinking, problem-solving, and design skills throughout all phases of the project, adapting to challenges and making informed decisions.
CO 7	Gain practical experience in working independently and collaboratively within a team environment, fostering effective communication and teamwork.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

General Guidelines:

1. **Project Scope**: The major project will involve the development and execution of a significant engineering undertaking. This may encompass a wide range of activities, including:
    - **Design Projects:** Creating novel solutions to engineering problems, such as designing new devices, systems, or processes.
    - **Experimental Studies:** Conducting research through experimentation, collecting and analyzing data, and drawing conclusions.
    - **Computer Simulations:** Utilizing computational models and simulations to investigate and analyze engineering phenomena.

    All projects must focus on topics relevant to the specific Department's specialization, ensuring a strong connection to the core curriculum and industry practices.

2. **Project Components:** The successful completion of the major project necessitates the integration of several critical components:
    - **Problem Identification & Definition:** Clearly identifying and defining an engineering problem or challenge within the project scope.
    - **Literature Review:** Conducting thorough research on existing knowledge, methodologies, and best practices related to the project.
    - **Problem Formulation:** Translating the identified problem into a well-defined set of engineering objectives and constraints.
    - **Design & Development:** Designing, developing, and implementing solutions, which may include:
        - Conceptual design and ideation
        - Detailed design and prototyping
        - System integration and testing
    - **Utilization of Modern Tools & Techniques:** Employing relevant and contemporary engineering tools and techniques throughout the project, such as:
        - Computer-Aided Design (CAD) software
        - Simulation and analysis software (e.g., FEA, CFD)
        - Data acquisition and analysis tools
        - Project management software
3. **Project Synopsis Submission**: Students are required to submit a project synopsis outlining the proposed major project. This synopsis must include the following:
    - **Project Scope:** A clear and concise description of the project, including its objectives, boundaries, and relevance to the chosen area of specialization.
    - **Project Objectives:** Specific, measurable, achievable, relevant, and time-bound (SMART) objectives that the project aims to achieve.
    - **Methodology:** A detailed description of the project approach, including:
        - Research methodology (e.g., literature review, experimental design, simulation methods)
        - Design and development process (if applicable)

- Data collection and analysis methods
- **Resources & Tools:** A list of anticipated resources, including:
  - Software (e.g., CAD, simulation, data analysis)
  - Equipment and materials
  - Access to facilities (e.g., laboratories, workshops)
- **Expected Results:** A clear statement of the anticipated outcomes of the project, including:
  - Measurable results (e.g., performance data, design specifications, research findings)
  - Potential impact and contributions
- **Project Timeline:** A realistic and detailed project schedule, including key milestones and deadlines for completion.

The project synopsis submission serves as a crucial step in the project planning process, ensuring that students have a well-defined plan before commencing their work.

4. **Project Duration**: The project work is structured to be completed over four semesters (6 - 7), with the same group continuing to work under the guidance of the assigned project guide throughout this period.

5. **Group Formation**: Students will typically work in groups of 2 to 4 members to complete the major project. The maximum group size is strictly limited to 4 members.

6. **Assessment**

- **Project Synopsis & Progress Presentations:** The project synopsis and progress presentations will be evaluated using established rubrics.
- **Project Diary & Report** - The project diary, meticulously maintained throughout the project duration, will be a crucial component of the overall assessment.The final project report will be assessed during the End-Semester Examination (ESE).
- **Project Presentations** - Students will make three presentations before the project evaluation committee. These presentations will be collectively assessed.

In Semester Evaluation	
Particulars	**Marks**
Synopsys Presentation	10
Progress Presentation-I	10
Progress Presentation-II	15
Progress Presentation-III	15
End Semester Examinations	
Project Work Report	25
Viva-Voce Examination	25

7. Submission Requirements

➔ **Project Work Diary**

- **Maintenance:** Meticulously maintained by the group throughout the project duration.
- **Entries:** Reflects daily or weekly efforts, including project selection, literature review, experimental work, data analysis, and any other relevant activities.
- **Countersignature**: Weekly countersigned by the assigned project guide.

➔ **Project Synopsis:**

- ★ Format: Submitted in the prescribed format, including:
  - Project Title
  - Student Names & URNNumbers
  - Guide's Name & Department
  - Project Relevance & Significance
  - Comprehensive Literature Review (minimum 10 peer-reviewed journal articles)
  - Proposed Work: Objectives, Methodology, and Approach
  - Expected Outcomes
  - Detailed Budget Estimate
  - References (in the specified format)
- ★ Approval:
  - Signed by each group member.
  - Approved by the project guide.
  - Endorsed by the Head of the Department.

➔ **Project Report:**

- Format:
  - Typed report of minimum 50 and maximum 100 pages.
  - Adheres to the standardized format for page size, margins, font, and spacing
  - References: All references (journal articles, books) must be cited correctly in the specified format.

➔ **Project Presentations:**

- **Presentations:** Students must present their project progress to faculty members and review panel members during scheduled reviews.
- **Submission:** Soft copies of all presentation slides (PowerPoint/PPT) must be submitted to the project guide.

➔ **Project Documentation:**

The Project Coordinator shall maintain a separate file with following documents

- Approved Project Synopsis
- Project Review Schedule
- Soft Copies of all presentation slides in Google Drive
- Assessment marks for each review, along with the corresponding rubrics.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Class			B. Tech., Sem.-VII
Course Code and Course Title			**2EEVS411, Renewable Energy Systems Simulation Lab**
Prerequisite/s			2EEPC301, 2EEPC303
Teaching Scheme: Lecture/Tutorial/Practical			00/00/02
Credits			01
Evaluation Scheme:	**P**	**ISE**	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
2EEVS411_1	**Demonstrate** Photo Voltaic systems with MPPT techniques to assess performance in various environmental conditions.
2EEVS411_2	**Simulate** single-phase and three-phase Phase Locked Loops for grid synchronization and stability.
2EEVS411_3	**Design** power converters for efficient energy conversion and battery charging/discharging.
2EEVS411_4	**Implement** grid-connected Photo Voltaic systems to evaluate grid stability and efficiency.
2EEVS411_5	**Investigate** Vehicle to Grid and Grid to Vehicle operations for energy storage and grid management.

List of Experiments	
1	Modelling of PV system
2	Simulation of Phase Locked Loop (PLL) for Single Phase and Three Phase
3	Simulation of PV MPPT (P&O and Incremental Conductance Method) using Boost Converter.
4	Simulation of Three Phase Grid Connected Inverter
5	Simulation of Grid connected PV MPPT (P&O) single stage
6	Simulation of Grid connected PV MPPT (P&O) double stage.
7	PV based Battery Charging using Buck Converter
8	PV Based Bidirectional Converter for Battery Charging/Discharging.
9	Simulation of V2G / G2V operation in Electric Vehicle Charger
10	Simulation study of wind energy generation

Minimum **Seven** experiments should be performed from the above list.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	MATLAB and Simulink In-Depth	Priyanka Patankar Swapnil Kulkarni	BPB Publications	1st	2022
2.	Renewable Energy Systems: Simulation with Simulink and Sim Power Systems	Viktor Perelmuter	CRC Press	-	2016
3.	Modeling and Simulation Using MATLAB - Simulink	Dr. Shailendra Jain	Wiley India Pvt. Limited	2nd	2015
4.	Renewable Energy Systems: Design and Analysis with Induction Generators	Mukund R. Patel	CRC Press	2nd	2012

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Photovoltaic Power System: Modeling, Design, and Control"	Weidong Xiao	Wiley	1st	2017
2.	Power Electronics: Converters, Applications, and Design	Ned Mohan, Tore M. Undeland, and William P. Robbins	Wiley	3rd	2002

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

Course Details:

Class			Final Year B. Tech. Semester – VIII
Course Code and Course Title			**2EEEL415, Internship**
Prerequisite/s			2EEEL218, 2EEEL308, 2EEEL318, 2EEEL410
Teaching Scheme: Lecture/Tutorial/Practical			00/00/00
Credits			10
Evaluation Scheme	**P**	**ISE/ESE**	100/00

Course Outcomes (COs): After successful completion of this course, the student will be able to:	
2EEEL415 _1	**Utilize** engineering concepts to engage in real-world projects within a professional environment
2EEEL415 _2	**Operate** industry-specific tools, software, and equipment efficiently.
2EEEL415 _3	**Exhibit** strong teamwork skills by working alongside industry professionals, peers, and mentors to successfully meet project goals, ensuring compliance with industry regulations and standards
2EEEL415_4	**Analyze** challenges encountered in industrial processes, proposing innovative and effective solutions.
2EEEL415_5	**Create** comprehensive reports, including case studies, and deliver impactful presentations that effectively convey insights and outcomes from projects and learning experiences.

Internship Requirements:

- All students are required to complete an internship at a research organization, university, or industry to gain practical exposure through meaningful projects that align with their academic learning. This internship must be approved by the Head of the Institution and has duration of a **minimum of 12 weeks and a maximum of 24weeks**, as specified in the curriculum.
- The tables below represent the outline of the internship guidelines and student responsibilities: For detailed guidelines and procedures, refer to the Institute Internship Policy Document.

Internship Guidelines:

1. Request Letter	Obtain a request letter from the institute, signed by the Institute Director, addressed to the HR manager or relevant authority.
2. Confirmation Letter	Submit the confirmation letter from the industry or organization to the Internship Coordinator and Department Office.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

3. Mentorship	• A faculty member will act as a mentor for a group of students to monitor, evaluate, and guide their internship activities. • The mentor will visit the internship location at least once or twice during the internship period and provide feedback to the Internship Coordinator.
4. Progress Reports	Submit progress reports every two weeks to the mentor, along with a final report to the Internship Coordinator.
5. Evaluation	The mentor and an assessment panel will evaluate student performance post-internship, submitting an evaluation report to the Department Office.
6. Internship Certificate	Obtain and submit an Internship Certificate from the organization to the Internship Coordinator.
7.Presentation and Term Work	Deliver a presentation on internship work as part of term assessments; submit an internship diary and report for evaluation.

Student Responsibilities

Category	Responsibilities
Professionalism	Adherence to workplace rules, ethical conduct, professional communication
Engineering Skills	Apply engineering fundamentals, use tools and software, conduct experiments, solve problems
Industry Knowledge	Learn industry standards, observe practices, understand project management
Professional Development	Improve communication, teamwork, problem-solving, time management, build network, enhance employability
Learning & Growth	Seek learning opportunities, apply classroom knowledge, maintain a journal, gain insights into career paths

Internship Evaluation Process

The Internship of students will be assessed in three key stages:

1. **Evaluation by Industry**
   - Punctuality
   - Willingness to learn
   - Daily diary maintenance
   - Skill test performance
   - Supervisor's remarks
2. **Evaluation by Faculty Mentor of Student performance and Internship Report**
   - Faculty Mentor will evaluate students based on their attendance, participation, and engagement during the internship.
   - The quality and completeness of the internship report will also be assessed.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

3. **Seminar Presentation/Viva-Voce at the Institute**

- Students will present a seminar based on their internship report before an expert committee formed by the relevant department, in accordance with institute norms.
- The evaluation criteria for the seminar presentation will include:
  - Quality of content presented
  - Planning and organization of the presentation
  - Effectiveness of delivery
  - Depth of knowledge and skills demonstrated
  - Attendance record, daily diary entries, and departmental reports will also be reviewed alongside the internship report.

This seminar presentation serves as an opportunity for students to share their knowledge and experiences with peers and faculty, enhancing their communication skills and building confidence.

Final Evaluation During the final evaluation, the student shall prepare and submit a report and give a presentation & Viva voce before his/her Department Committee at the college.

In-Semester Evaluation			
Criteria	**Evaluated By**	**Weightage (%)**	**Description**
Student Performance	Industry Supervisor	20%	Evaluated based on a rubric and feedback form, focusing on punctuality, eagerness to learn, skill tests, and professionalism
Submission of Internship Report with Certificate	Institute	20%	Assesses the quality, structure, and content of the report submitted by the student, reviewed by the mentor, along with the internship certificate.
Internship Diary, Attendance Record, and Industry-Faculty Interaction	Institute (During and End of Internship)	10%	Evaluates consistency and detail in maintaining the diary, adherence to attendance, and meaningful engagement during interactions with mentors.
Presentation, Demonstration, or Case Studies	Institute	20%	Assesses the student's ability to effectively communicate insights, demonstrate practical learning outcomes, or analyze and present case studies.
Viva-Voce	Institute	30%	Tests the student's depth of understanding, analytical skills, and ability to articulate their internship experience during an oral evaluation.

Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**