

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

M.E. Power Systems Engineering (as per Regulation 2020)

Amendments in Professional Elective Courses (PE)

(With effect from academic year 2024 – 2025)

S. No.	Course Code	Course Name	Category	Contact Periods	Credits			
					L	T	P	C
Professional Elective I (1 st Semester)								
1.	PS1131	Computer Aided Design of Electrical Apparatus	PE	3	3	0	0	3
2.	PS1132	Industrial Power System Analysis and Design	PE	3	3	0	0	3
3.	PS1133	Nano Materials and Applications of High Voltage Engineering	PE	3	3	0	0	3
4.	PS1134	Power System Planning and Reliability	PE	3	3	0	0	3
5.	PS1135	Power System Voltage Stability	PE	3	3	0	0	3
6.	PS1140	Research Methodology	PE	3	3	0	0	3
Professional Elective II (2 nd Semester)								
1.	PS1231	AI Techniques for Power Systems	PE	3	3	0	0	3
2.	PS1232	Distributed Generation and Microgrid	PE	3	3	0	0	3
3.	PS1233	Electric Vehicles and Power Management	PE	3	3	0	0	3
4.	PS1234	Energy Management and Auditing	PE	3	3	0	0	3
5.	PS1236	Wind Energy Conversion Systems	PE	3	3	0	0	3
6.	PS1237	Solar and Energy Storage Systems	PE	3	3	0	0	3
Professional Elective III (3 rd Semester)								
1.	PS1331	Electromagnetic Field Computation and Modelling	PE	3	3	0	0	3
2.	PS1332	Power Quality Assessment and Mitigation	PE	3	3	0	0	3

S. No.	Course Code	Course Name	Category	Contact Periods	Credits			
					L	T	P	C
3.	PS1333	Power System Optimization	PE	3	3	0	0	3
4.	PS1334	Power System State Estimation	PE	3	3	0	0	3
5.	PS1335	SCADA and DCS	PE	3	3	0	0	3
6.	PS1336	Smart Grid Technologies	PE	3	3	0	0	3
Professional Elective IV (3rd Semester)								
1.	PS1337	Application of Power Electronics in Power Systems	PE	3	3	0	0	3
2.	PS1338	Control and Protection of Microgrid	PE	3	3	0	0	3
3.	PS1339	Design of Substations	PE	3	3	0	0	3
4.	PS1340	Electrical Safety & Hazard Management	PE	3	3	0	0	3
5.	PS1341	Energy Efficient Building Management Systems	PE	3	3	0	0	3
6.	PS1342	IoT for Power Engineers	PE	3	3	0	0	3


Staff Incharge


HoD/EEE


Dean Academics


Controller of Examination


Principal

Course Code	Course Name	L	T	P	C
PS1140	RESEARCH METHODOLOGY	3	0	0	3

Category: Special Elective

e. Preamble

To impart knowledge and skills required for research

- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Differentiate between Applied and Basic Research	K3
CO2	Summarize the advantages and disadvantages of each type of experiment in various research contexts.	K2
CO3	Analyze various data collection methods and capable of designing effective questionnaires	K3
CO4	Apply data analysis techniques to real-world research problems and datasets	K4
CO5	Prepare well-structured written reports that effectively communicate information, analysis, and recommendations	K3

c. Course Syllabus

TOTAL : 45 PERIODS

INTRODUCTION TO RESEARCH

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The hallmarks of scientific research - Building blocks of science in research - Concept of Applied and Basic research - Quantitative and Qualitative Research Techniques - Need for theoretical frame work - Hypothesis development - Hypothesis testing with quantitative data. Research design - Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

EXPERIMENTAL DESIGN

9

Laboratory and the Field Experiment - Internal and External Validity - Factors affecting Internal validity. Measurement of variables - Scales and measurements of variables. Developing scales - Rating scale and attitudinal scales - Validity testing of scales - Reliability concept in scales being developed - Stability Measures.

DATA COLLECTION METHODS

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Interviewing, Questionnaires, etc., Secondary sources of data collection. Guidelines for Questionnaire Design - Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data - Collection Methods and their utility. Sampling Techniques - Probabilistic and non probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.

MULTIVARIATE STATISTICAL TECHNIQUES

9

Data Analysis - Factor Analysis - Cluster Analysis - Discriminant Analysis - Multiple Regression and Correlation - Canonical Correlation - Application of Statistical (SPSS) Software Package in Research.

RESEARCH REPORT

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Purpose of the written report - Concept of audience - Basics of written reports. Integral parts of a report - Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report - Experimental, Results and Discussion - Recommendations and Implementation section - Conclusions and Scope for future work.

d. Learning Resources

Text Books

1. Donald, R., Cooper and Ramcis, S. Schindler, *Business Research Methods*, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2000.
2. Sekaran, U., *Research Methods for Business*. John Willey & Sons, Inc. New York. 2000.

Reference Books

1. McBurney, D.H., *Research Methods*, Thomson Asia Pvt. Ltd. Singapore. 2002.
2. Kumar, R., *Research methodology: A step-by-step guide for beginners*. SAGE Publications, 2018.

PS1237	SOLAR AND ENERGY STORAGE SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Study about solar modules and PV system design and their applications
- To Deal with grid connected PV systems
- To Discuss about different energy storage systems

UNIT I INTRODUCTION 9

Characteristics of sunlight – semiconductors and P-N junctions –behavior of solar cells – cell properties – PV cell interconnection, modeling of PV cells, Partial Shading in PV, Bypass Diode and Blocking Diode Application.

UNIT II STAND ALONE PV SYSTEM 9

Solar modules – storage systems – power conditioning and regulation – MPPT (P&O and IC Methods) - protection – standalone PV systems design – sizing of solar system for 5 HP motor pump.

UNIT III GRID CONNECTED PV SYSTEMS 9

PV systems in buildings – design issues for central power stations – safety – Economic aspect – Efficiency and performance - International PV programs

UNIT IV ENERGY STORAGE SYSTEMS 9

Impact of intermittent generation – Battery energy storage – solar thermal energy storage – pumped hydroelectric energy storage, fuel cells, ultra capacitor and compressed air technologies.

UNIT V APPLICATIONS 9

Water pumping – battery chargers – solar car – direct-drive applications –Space – Telecommunications, Simulation of PV systems.

TOTAL:45 PERIODS

OUTCOMES:

Upon Successful Completion of this course, the students will be able to

- CO1: Illustrate the concept of modelling and analysis of PV cells
- CO2: Design the standalone PV system for a typical application
- CO3: Describe the design issues in grid connected PV system.
- CO4: Explain about the modeling of different energy storage systems and their performances
- CO5: Design PV system for various application such as water pumping, battery chargers, solar car, direct-drive applications, space & telecommunications

REFERENCES:

1. Solanki, C.S., 2015. *Solar photovoltaics: fundamentals, technologies and applications*. PHI Learning Pvt. Ltd..
2. Wenham, S.R., 2011. *Applied photovoltaics*. Routledge.
3. Lorenzo, E., 1994. *Solar electricity: engineering of photovoltaic systems*. Earthscan/James & James.
4. Barnes, F.S. and Levine, J.G. eds., 2011. *Large energy storage systems handbook*. CRC press.

5. McNeils, Frenkel, Desai, 1990. *Solar & Wind Energy Technologies*, Wiley Eastern.
6. Sukhatme, S.P. and Nayak, J.K., 2017. *Solar energy*. McGraw-Hill Education.