

Savitribai Phule Pune University
S.E. Electrical Engineering 2015 – Course
(w. e. f. 2016-2017)

Semester I													
Sr. No.	Subject Code	Subject Title	Teaching Scheme			Semester Examination Scheme of Marks						Credit	
			Th.	Tut.	Pr.	Paper		TW	PR	OR	Total	TH/TUT	PR+OR
						In Sem (Online)	End Sem						
1.	203141	Power Generation Technologies	04	--	--	50	50	--	--	--	100	04	---
2.	207006	Engineering Mathematics-III	04	01	--	50	50	25	--	--	125	05	---
3.	203142	Material Science	04	--	02	50	50	--	--	50	150	04	01
4.	203143	Analog and Digital Electronics	04	--	02	50	50	25	50	--	175	04	01
5.	203144	Electrical Measurements and Instrumentation	04	--	02	50	50	25	50	--	175	04	01
6.	203151	Soft Skills I	--	--	02	--	--	25	--	--	25	--	01
Total											21	04	
Audit Course I			--	--	--	--	--	--	--	--	--	Grade: PP/NP	
Total			20	01	08	250	250	100	100	50	750	25	

Semester II													
Sr. No.	Subject Code	Subject Title	Teaching Scheme			Semester Examination Scheme of Marks						Credit	
			Th.	Tut.	Pr.	Paper		TW	PR	OR	Total	TH/TUT	PR+OR
						In Sem (Online)	End Sem						
1.	203145	Power System I	04	--	--	50	50	--	--	--	100	04	--
2.	203146	Electrical Machines I	04	--	02	50	50	25	50	--	175	04	01
3.	203147	Network Analysis	04	--	02	50	50	50	--	--	150	04	01
4.	203148	Numerical Methods and Computer Programming	04	01	02	50	50	25	50	--	175	05	01
5.	203149	Fundamentals of Microcontroller and Applications	04	--	02	50	50	--	--	50	150	04	01
Total											21	04	
Audit Course II			--	--	--	--	--	--	--	--	--	Grade: PP/NP	
Total			20	01	08	250	250	100	100	50	750	25	

TW: Term Work OR: Oral PR: Practical

PP: Passed (Only for non-credit courses) NP: Not Passed (Only for non-credit courses)

203151: Soft Skills

Teaching Scheme
PR : 02 Hrs/ Week

Credits
PR: 01

Examination Scheme [Marks]
Term Work : 25 Marks

Course Objective: The course aims to:-

- To possess knowledge of the concept of Self-awareness and Self Development.
- To Understand the importance of Speaking Skills, listening skills, Presentation Skills and leadership skills.
- To gain the knowledge of corporate grooming & dressing, Email & telephone etiquettes, etiquettes in social & office setting.
- To get conversant with Team work, Team effectiveness, Group discussion, Decision making.
- To recognize the importance of time management and stress management.

Course Outcome: Students will be able to :-

- Do SWOT analysis.
- Develop presentation and take part in group discussion.
- Understand and Implement etiquettes in workplace and in society at large.
- Work in team with team spirit.
- Utilize the techniques for time management and stress management.

Unit 01 : Self-Awareness & self-Development: (4 Hrs)

- A) Self-Assessment , Self-Appraisal, SWOT, Goal setting - Personal & career - Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting,
- B) Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting and prioritization.

Unit 02 : Communication Skill: (6 Hrs)

- A) Importance of communication, types, barriers of communication, effective communication.
- B) **Speaking Skills:** Public Speaking, Presentation skills, Group discussion- Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self-expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques.
- C) **Listening Skills:** Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening-
- D) **Group Discussion:** Characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency.
- E) **Presentation skills:** Planning, preparation, organization, delivery.
- F) **Written Skills:** Formal & Informal letter writing, Report writing, Resume writing - Sentence structure, sentence coherence, emphasis. Paragraph writing. Letter writing skills – form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc.

203151: Soft Skills

Teaching Scheme
PR : 02 Hrs/ Week

Credits
PR: 01

Examination Scheme [Marks]
Term Work : 25 Marks

Course Objective: The course aims to:-

- To possess knowledge of the concept of Self-awareness and Self Development.
- To Understand the importance of Speaking Skills, listening skills, Presentation Skills and leadership skills.
- To gain the knowledge of corporate grooming & dressing, Email & telephone etiquettes, etiquettes in social & office setting.
- To get conversant with Team work, Team effectiveness, Group discussion, Decision making.
- To recognize the importance of time management and stress management.

Course Outcome: Students will be able to :-

- Do SWOT analysis.
- Develop presentation and take part in group discussion.
- Understand and Implement etiquettes in workplace and in society at large.
- Work in team with team spirit.
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Unit 01 : Self-Awareness & self-Development: (4 Hrs)

- A) Self-Assessment , Self-Appraisal, SWOT, Goal setting - Personal & career - Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting,
- B) Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting and prioritization.

Unit 02 : Communication Skill: (6 Hrs)

- A) Importance of communication, types, barriers of communication, effective communication.
- B) **Speaking Skills:** Public Speaking, Presentation skills, Group discussion- Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self-expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques.
- C) **Listening Skills:** Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening-
- D) **Group Discussion:** Characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency.
- E) **Presentation skills:** Planning, preparation, organization, delivery.
- F) **Written Skills:** Formal & Informal letter writing, Report writing, Resume writing - Sentence structure, sentence coherence, emphasis. Paragraph writing. Letter writing skills – form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc.

Audit Course I

Solar Thermal Systems

Course Name: Solar Thermal Systems

Prerequisite: Completion of FE or equivalent

Teaching Scheme:

Lectures: 2 h per week
Field Visit: 4 h

Examination Schemes: Audit (P/F)

Written and MCQ
Term paper

Description:

The course will introduce the basics of: solar energy, availability, applications, heat transfer as applied to solar thermal systems, various types of solar thermal systems, introduction to manufacturing of the systems, characterization, quality assurance, standards, certification and economics. The following topics may be broadly covered in the classroom. The field visits will be designed for firsthand experience and basic understanding of the system elements.

Course Objective:

- To understand basics and types of solar thermal systems.
- To get knowledge of various types of concentrators.
- To make students aware of different Standards and certification for Concentrator Solar Power.

Course Outcome: Student Will be able to

- Differentiate between types of solar Concentrators
- Apply software tool for solar concentrators
- Design different types of Solar collectors and balance of plant

Course Contents:

- Sun, Earth and seasons
- Solar Radiation
- Basics of heat transfer
- Absorption, reflection and transmission of radiation
- Types of Solar thermal systems
- Basic design of different types of systems
- Applications of solar thermal systems and their economics
- Need for solar concentration
- Various types of solar concentrators
- Movement of Sun and tracking
- Control systems for solar tracking
- Concentrating solar thermal (CSP)
- Concentrating solar PV (CPV)
- Balance of plant for CSP
- Critical points in concentrating solar system installation
- Operation and maintenance of CSP

Savitribai Phule Pune University

Syllabus: Second Year (SE) Electrical Engineering (2019 Course) w.e.f. AY:2020-2021

SEMESTER-I

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks						Credits			
		TH	PR	TUT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
207006	Engineering Mathematics-III	03	--	--	30	70	--	--	--	100	03	--	--	03
203141	Power Generation Technologies	03	--	--	30	70	--	--	--	100	03	--	--	03
203142	Material Science	03	04#	--	30	70	25	--	25	150	03	02	--	05
203143	Analog and Digital Electronics	03	02	--	30	70	--	50	--	150	03	01	--	04
203144	Electrical Measurement & Instrumentation	03	04#	--	30	70	25	25	--	150	03	02	--	05
203150	Applications of Mathematics in Electrical Engineering	--	02*	--	--	--	25	--	--	25	--	01	--	01
203151	Soft Skill	--	02	--	--	--	25	--	--	25	--	01	--	01
203152	Audit Course-III	--	--	--	--	--	--	--	--	--	Grade: PP/NP			
Total		15	14	--	150	350	100	75	25	700	15	07	--	22

SEMESTER-II

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks						Credits			
		TH	PR	TUT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
203145	Power System-I	03	--	--	30	70	--	--	--	100	03	--	--	03
203146	Electrical Machines-I	03	02	--	30	70	--	50	--	150	03	01	--	04
203147	Network Analysis	03	02	--	30	70	25	--	--	125	03	01	--	04
203148	Numerical Methods & Computer Programming	03	02	--	30	70	--	25	--	125	03	01	--	04
203149	Fundamental of Microcontroller and Applications	03	04\$	--	30	70	25	--	25	150	03	02	--	05
203152	Project Based Learning	--	04	--	--	--	50	--	--	--	--	02	--	--
203153	Audit Course-IV	--	--	--	--	--	--	--	--	--	Grade: PP/NP			
Total		15	14	--	150	350	100	75	25	700	15	07	--	22

* - Lab sessions on application of Mathematics in Electrical Engineering using professional software.

- Practical section will comprises of two Part : a) PART A : 2 hours per week : Regular curriculum listed practical total 12 numbers out of which conduction of 8 numbers will be mandatory b) PART B : 2 Hours a week :Practical/case studies/assignments to enable active learning based on advances related to subject to bridge gap between curriculum and enhance practical knowledge required in field .

\$ - Practical section will comprises of two Part : a) PART A : 2 hours per week : Regular curriculum listed practical total 12 numbers out of which conduction of 8 numbers will be mandatory b) PART B : 2 Hours a week : IOT application in Electrical Engineering using microcontroller and GSM module to bridge gap between curriculum and enhance application knowledge.

Abbreviation: TH: Theory, PR: Practical, TUT:Tutorial, ISE: Insem Exam, ESE: End Sem Exam, TW: Term Work, OR: Oral

203151: Soft Skill		
Teaching Scheme Practical : 02 Hrs/ Week	Credits Pr:01	Examination Scheme [Marks] Term Work: 25 Marks
<p>Course Objective: The course aims to:- □</p> <ul style="list-style-type: none"> ● To possess knowledge of the concept of Self-awareness and Self Development. □ ● To understand the importance of Speaking Skills, listening skills, Presentation Skills and leadership skills. □ ● To gain the knowledge of corporate grooming & dressing, Email & telephone etiquettes, etiquette in social & office setting. □ ● To get conversant with Team work, Team effectiveness, Group discussion, Decision making. ● To recognize the importance of time management and stress management. <p>Course Outcome: Students will be able to :- □</p> <p>CO1: DoSWOC analysis. □</p> <p>CO2: Develop presentation and take part in group discussion. □</p> <p>CO3: Understand and implement etiquette in workplace and in society at large. □</p> <p>CO4: Work in team with team spirit. □</p> <p>CO5: Utilize the techniques for time management and stress management.</p>		
<p>Unit 01 : Self-Awareness & self-Development: (4Hrs)</p> <p>A) Self-Assessment , Self-Appraisal, SWOT, Goal setting - Personal & career - Self Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting,</p> <p>B) Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting and prioritization.</p>		
<p>Unit 02 : Communication Skill: (6 Hrs)</p> <p>A) Importance of communication, types, barriers of communication, effective communication.</p> <p>B) Speaking Skills: Public Speaking, Presentation skills, Group discussion- Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self-expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques.</p> <p>C) Listening Skills:Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening</p> <p>D) Group Discussion:Characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency.</p> <p>E) Presentation skills:Planning, preparation, organization, delivery.</p> <p>F) Written Skills: Formal & Informal letter writing, Report writing, Resume writing - Sentence structure, sentence coherence, emphasis. Paragraph writing. Letter writing skills – form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc.</p>		
<p>Unit 03 : Corporate / Business Etiquette: (2 Hrs)</p> <p>Corporate grooming & dressing, Email & telephone etiquette, etiquette in social & office setting: Understand the importance of professional behavior at the work place, Understand and Implement etiquette in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Body language, Meeting etiquette (targeted at young professionals who are just entering business environment), Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities.</p>		
<p>Unit 04 : Interpersonal relationship: (4 Hrs)</p> <p>A) Team work, Team effectiveness, Group discussion, Decision making – Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity.</p> <p>B) Group Discussion- Preparation for a GD, Introduction and definitions of a GD, Purpose of a GD, Types of GD, Strategies in a GD, Conflict management, Do's and Don'ts in GD</p>		
<p>Unit 05 : Leadership skills: (2 Hrs)</p>		

203152: Project Based Learning		
Teaching Scheme Practical : 04 Hrs/ Week	Credits PR:02	Examination Scheme [Marks] Term Work: 50 Marks
<p>Preamble: For better learning experience, along with traditional classroom teaching and laboratory learning, project-based learning has been introduced to motivate students to learn by working in a group cooperatively to solve a problem. Project-Based Learning (PBL) is a student-centered and experimental approach to education promoting 'deeper learning' through active exploration of real-world problems and challenges. A central goal of PBL is to facilitate the deeper learning process and support students' acquisition of complex cognitive competencies, e.g., rigorous content knowledge and critical thinking skills. The PBL engages students in the problem definition, design process, contextual understanding, and systems thinking approaches. In the PBL approach, learning based on memorization is de-emphasized and more emphasis is given on understanding and application of engineering design principles. Because of frequent assessments throughout the course, plagiarism can be more easily controlled.</p>		
<p>Course Objectives: Objectives of this course are to</p> <ol style="list-style-type: none"> 1. Impart technical knowledge and skills, and develop deeper understanding to integrate knowledge and skills from various areas. 2. Build critical thinking, problem-solving, communication, collaboration and creativity, and innovation amongst students 3. Make students aware of their own academic, personal, and social developments. 4. Develop habits of self-evaluation and self-criticism, against self-competency and trying to see beyond own ideas and knowledge 		
<p>Course Outcomes: At the end of this project-based learning, students will be able to</p> <p>CO1: Identify, formulate, and analyze the simple project problem.</p> <p>CO2: Apply knowledge of mathematics, basic sciences, and electrical engineering fundamentals to develop solutions for the project.</p> <p>CO3: Learn to work in teams, and to plan and carry out different tasks that are required during a project.</p> <p>CO4: Understand their own and their team-mate's strengths and skills.</p> <p>CO5: Draw information from a variety of sources and be able to filter and summarize the relevant points.</p> <p>CO6: Communicate to different audiences in oral, visual, and written forms.</p>		
<p>Procedure: A group of 4-5 students will be assigned to a faculty member called a mentor. Based on the engineering knowledge of a group and societal and industry problems, the mentor has to guide a group to identify project problems and plan the work schedule. Here, the expected outcomes of the project must be noted. The complete work-plan should be divided in the form of the individual tasks to be accomplished with targets. Weekly review of the completed task should be taken and further guidelines are to be given to a group. The final activity will be presenting the work completed and submitting the report. A group should be promoted to participate in a competition or write a paper.</p> <p>A problem needs to refer back to a particularly practical, scientific, social, and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry. There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content, and the structure of the activity. It may have</p> <ul style="list-style-type: none"> ✓ A few hands-on activities that may or may not be multidisciplinary. ✓ Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize, and present their learning. ✓ Activities on solving real-life problems, investigation /study, and writing reports of in-depth study, fieldwork. 		
<p>Assessment: The department/mentor is committed to assess and evaluate both students' performance and</p>		

Savitribai Phule Pune University
FACULTY OF ENGINEERING
T.E. Electrical Engineering (2015 Course)
(w.e.f. 2017-2018)

SEMESTER-I													
Sr. No	Subject Code	Subject Title	Teaching Scheme			Examination Scheme					Total Marks	Credit	
			Th	Pr.	Tu.	PP		TW	PR	OR		TH/TU	PR+OR
						In Sem	End Sem						
1	311121	<u>Industrial and Technology Management</u>	03	--	--	30	70	--	--	--	100	03	--
2	303141	<u>Advance Microcontroller and its Applications</u>	04	02	--	30	70	--	--	50	150	04	01
3	303142	<u>Electrical Machines II</u>	04	02	--	30	70	--	50	--	150	04	01
4	303143	<u>Power Electronics</u>	04	02	--	30	70	--	50	--	150	04	01
5	303144	<u>Electrical Installation, Maintenance and Testing</u>	03	02	--	30	70	50	--	--	150	03	01
6	303145	<u>Seminar and Technical Communication</u>	--	02	--	--	--	50	--	--	50	--	01
	303152	<u>Audit Course III</u>											
TOTAL			18	10	--	150	350	100	100	50	750	18	05

SEMESTER-II													
Sr. No.	Subject Code	Subject Title	Teaching Scheme			Examination Scheme					Total Marks	Credit	
			Th.	Pr.	Tu.	PP		TW	PR	OR		TH/TU	PR+OR
						In Sem	End Sem						
1.	303146	<u>Power System II</u>	04	02	--	30	70	--	50	--	150	04	01
2.	303147	<u>Control System I</u>	04	02	--	30	70	-	--	50	150	04	01
3.	303148	<u>Utilization of Electrical Energy</u>	03	--	--	30	70	--	--	--	100	03	--
4.	303149	<u>Design of Electrical Machines</u>	04	02	--	30	70	25	--	50	175	04	01
5.	303150	<u>Energy Audit and Management</u>	03	02	--	30	70	25	--	--	125	03	01
6.	303151	<u>Electrical Workshop</u>	--	02	--	--	--	50	--	--	50	--	01
	303153	<u>Audit Course IV</u>											
Total			18	10	--	150	350	100	50	100	750	18	05

Th: Theory lectures hours/week
Pr: Practical hours/week
Tu: Tutorial hours/week

TW: Term work
PR: Theory
OR: Oral
pp: Paper- In semester and End Semester

311121: Industrial And Technology Management

Teaching Scheme	Credits	Examination Scheme [Marks]
Theory: 03 Hrs./Week	03	In Sem. : 30 Marks End Sem.:70 Marks

Course Objective:

The course aims to

- Possess knowledge of types of business organizations; explore the fundamentals of economics and Management.
- Understand the basic concepts of Technology management and Quality management.
- Analyse and differentiate between marketing management and financial management.
- Recognize the importance of Motivation, Group dynamics, Team work, leadership skill and entrepreneurship.
- Explain the fundamentals of Human Resource management.
- Identify the importance of Intellectual property rights and understand the concept of patents, copy rights and trademarks.

Course Outcome:

Upon successful completion of this course, the students will be able to

- Differentiate between different types of business organization and discuss the fundamentals of economics and management.
- Explain the importance of technology management and quality management.
- Describe the characteristics of marketing and its types.
- Discuss the qualities of a good leader.

Unit 01: Introduction to managerial and economical demand (06Hrs)

Managerial Economics: Definition of economics, Demand and Supply concept, Law of demand and supply, Elasticity of demand and supply, Demand forecasting: Meaning and methods.

Management: Meaning, scope, function, and importance of management. Difference between administration and management. Types of business ownership: Sole proprietorship, Partnership (Act 1934), LLP (Limited Liability Partnership), (Act2008). Business Organizations: Line organization, Line and Staff organization and Functional Organization. Joint Stock Company: Public Limited and Private Limited, Public Sector Undertaking (PSU)

Unit 2: Technology and Industrial Management (06Hrs)

Introduction to industrial management: Concept, development, application and its scope.

Introduction of Technology Management : Definition of technology, Management and its relation with society, classification of technology, Management of technology at various levels- its importance on National Economy, Ethics in technology management, Critical Factors in technology management.

303145: Seminar and Technical Communication

Teaching Scheme	Credits	Examination Scheme
Practical : 02 Hr/Week	01	Term work : 50 Marks

Course Objectives:

- Gaining of actual knowledge (terminology, classification, methods and advanced trends)
- Learning fundamental principles, generalization or theories
- Discussion and critical thinking about topics of current intellectual importance
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to the course.

Course Outcomes:

At the end of this student will able to

- Relate with the current technologies and innovations in Electrical engineering.
- Improve presentation and documentation skill.
- Apply theoretical knowledge to actual industrial applications and research activity.
- Communicate effectively.

Seminar should be based on a detailed study of any topic related to the advance areas/applications of Electrical Engineering. Topic should be related to Electrical Engineering. However it must not include contents of syllabus of Electrical Engineering.

It is expected that the student should collect the information from journals, internet and reference books in consultation with his/her teacher/mentor, have rounds of discussion with him/her. The report submitted should reveal the students assimilation of the collected information. Mere compilation of information from the internet and any other resources is discouraged.

Format of the Seminar report should be as follows:

1. The report should be neatly typed on white paper. The typing shall be with normal spacing, Times New Roman (12 pt) font and on one side of the paper. (A-4 size).
2. Illustrations downloaded from internet are not acceptable.
3. The report should be submitted with front and back cover of card paper neatly cut and bound together with the text.
4. Front cover: This shall have the following details with Block Capitals
 - a. Title of the topic.
 - b. The name of the candidate with roll no. and Exam. Seat No. at the middle.
 - c. Name of the guide with designation below the candidate's details.
 - d. The name of the institute and year of submission on separate lines at the bottom.
5. Certificate from institute as per specimen, Acknowledgement and Contents.
6. The format of the text of the seminar report should be as follows
 - i. The introduction should be followed by literature survey

Audit Course III

303152 (A): Wind Energy Systems

Course Name: Wind Energy Systems

Prerequisite: Completion of FE or equivalent

Teaching Scheme:

Lectures 2 h per week

Field Visit: 1 day

Examination Schemes: Audit (P/F)

Written / MCQ /

Term paper

Description:

The following topics may be broadly covered in the classroom. The course will introduce the basics of: wind energy, availability, introduction to wind machines, generators, basics of design of wind electric generators, small and large wind machines, various designs and types of wind machines, grid interaction, **advantages** and limitations of the technology, **environmental impact**, introduction to manufacturing of the systems, characterization, quality assurance, standards, certification and economics. The site visit will be organized to understand the basic operation and system elements.

Details:

- Energy in wind, Basic **wind energy conversion**
- Introduction to wind turbines, Types of wind energy systems
- Typical construction of various wind energy systems
- Wind electricity generation systems
- Environmental impact of wind electricity generators
- **Economics and sustainability of wind electricity**
- Introduction to Wind Electricity Generation (WEG) systems
- Wind turbine basics and design
- Generator designs for WEG
- Small and large WEG systems, Site requirements for WEG
- Controllers for WEG systems
- Grid integration of WEG
- Economics of WEG
- Financial modeling of WEG
- Software tools for simulation, validation and economics of WEG
- Operation and maintenance of WEG
- **Environmental impact assessment**
- Standards and certification for WEG
- Basics of WEG systems, Elements of WEG systems for small and large scale
- Procurement versus production
- Bought-outs, assemblies, sub-assemblies
- Manufacturing and assembly, Manufacturing standards
- Quality assurance and standards, Certification
- Special purpose machines and Automation in manufacturing
- Site assembly and fabrication
- Typical shop layouts
- Inventory management
- Economics of manufacturing

Site Visit:

- Large-scale wind power plant

303150 : Energy Audit and Management

Teaching Scheme	Credits	Examination Scheme [Marks]
Theory : 03 Hrs./Week	03	In Sem. : 30 Marks
Practical : 02 Hrs./Week	01	End Sem. : 70 Marks
		Term Work : 25 Marks

Prerequisite:

- Concept of power and energy in three phase and single phase
- Various electrical equipments and specifications

Course Objective:

The course aims to:-

- Understand importance of energy Conservation and energy security.
- Understand impact of use energy resources on environment and emission standards.
- Follow format of energy management, energy policy.
- Learn various tools of energy audit and management
- Calculate energy consumption and saving options with economic feasibility.

Course Outcome:

Upon successful completion of this course, the students will be able to:-

- To get knowledge of BEE Energy policies, Electricity Acts.
- Use various energy measurement and audit instruments.
- Carry out preliminary energy audit of various sectors
- Enlist energy conservation and demand side measures for electrical, thermal and utility Systems.
- Solve simple problems on cost benefit analysis.

Unit 01: Energy Scenario

(6 Hrs.)

Classification of Energy resources, Commercial and noncommercial sources, primary and secondary sources, commercial energy production, final energy consumption. Energy needs of growing economy, short terms and long terms policies, energy sector reforms, energy security, importance of energy conservation, energy and environmental impacts, emission check standard, salient features of Energy Conservation Act 2001 and Electricity Act 2003. Indian and Global energy scenario. Introduction to IE Rules. Study of Energy Conservation Building Code (ECBC).

Unit 02: Energy Management

(6 Hrs.)

Definition and Objective of Energy Management, Principles of Energy management, Energy Management Strategy, Energy Manager Skills, key elements in energy management, force field analysis, energy policy, format and statement of energy policy, Organization setup and energy management. Responsibilities and duties of energy manager under act 2001. Energy Efficiency Programs. Energy monitoring systems.

Savitribai Phule Pune University, Pune
Syllabus: Third Year (TE) Electrical Engineering (2019 course)
(w.c.f 2021-22)

SEMESTER-I

Course code	Course Name	Teaching Scheme				Examination Scheme						Credit				
		Th	Pr	Tu	SEM /PW /IN	ISE	ESE	TW	PR	OR	Total	Th	Pr	Tu	SEM /PW /IN	Total
303141	<u>Industrial and Technology Management</u>	3	0	0	0	30	70	0	0	0	100	3	0	0	0	3
303142	<u>Power Electronics</u>	3	4#	0	0	30	70	0	50	0	150	3	2	0	0	5
303143	<u>Electrical Machines-II</u>	3	2	0	0	30	70	25	25	0	150	3	1	0	0	4
303144	<u>Electrical Installation Design and Condition Based Maintenance</u>	3	4#	0	0	30	70	25	0	25	150	3	2	0	0	5
303145	<u>Elective-I</u>	3	0	0	0	30	70	0	0	0	100	3	0	0	0	3
303146	<u>Seminar</u>	0	0	0	1	0	0	50	0	0	50	0	0	0	1	1
303147	<u>Audit course-V</u>	2*	0	0	0	0	0	0	0	0	0	GRADE: PP/NP				0
Total		15	10	0	1	150	350	100	75	25	700	15	5	0	1	21

303145: Elective-I

303147 : Audit Course-V

303145A : Advanced Microcontroller and Embedded System

303147A : Energy storage systems

303145B : Digital Signal Processing

303147B : Start-up & Disruptive innovation

303145C : Open Elective

SEMESTER-II

Course code	Course Name	Teaching Scheme				Examination Scheme						Credit				
		Th	Pr	Tu	SEM /PW /IN	ISE	ESE	TW	PR	OR	Total	Th	Pr	Tu	SEM /PW /IN	Total
303148	<u>Power System-II</u>	3	2	1	0	30	70	25	50	0	175	3	1	1	0	5
303149	<u>Computer Aided Design of Electrical Machines</u>	3	4#	0	0	30	70	50	0	25	175	3	2	0	0	5
303150	<u>Control System Engineering</u>	3	2\$	1\$	0	30	70	25	0	25	150	3	1	0	0	4
303151	<u>Elective-II</u>	3	0	0	0	30	70	0	0	0	100	3	0	0	0	3
303152	<u>Internship</u>	0	0	0	4	0	0	100	0	0	100	0	0	0	4	4
303153	<u>Audit Course VI</u>	2*	0	0	0	0	0	0	0	0	0	GRADE: PP/NP				0
Total		12	8	2	4	120	280	200	50	50	700	12	4	1	4	21

303151: Elective-II

303153 : Audit Course-VI

303151A : IoT and its Applications in Electrical Engineering

303153A : Ethical Practices for Engineers

303151B : Electrical Mobility

303153B : Project Management

303151C : Cybernetic Engineering

303151D : Energy Management

#Practical consists of Part A & part B. PART A; Regular experiments & part B; to bridge the gap between theory & actual industrial practices. For subject 303144; there will be auto cad drawing on Electrical installation, Electrical wiring, cabling etc. For 303149, Part A, Regular drawing by hand & part B same drawing by AutoCAD.

\$ tutorial credit merged with Practical.

* Conduct over and above these lectures.

303152: Internship					
Teaching Scheme			Credits		Examination Scheme
IN	04	Hr/Week	IN	04	TW 100 Marks
Preamble					
Internship is a short-term industrial working experience for the students. The internship aims at providing entry-level exposure to a particular industry. It is expected that students should spend time working on relevant projects or part of the project and acquire learning about the field, along with developing industry connections, and employability skills.					
Course Objectives:					
<ol style="list-style-type: none"> 1. Encourage and provide opportunities to the students to acquire professional learning experiences. 2. Empower students to relate and then apply the theoretical knowledge in real-life industrial situations. 3. Provide exposure for handling and using various tools, measuring instruments, meters, and technologies used in industries. 4. Enable students to develop professional and employability skills and expand their professional network. 5. Empower students to apply the internship learnings to the academic courses and project completions. 6. Impart professional and societal ethics in students through the internship. 7. Make students aware of social, economic, and administrative aspects influencing the working environment of the industry. 					
Course Outcomes: At the end of this course, student will be able to					
CO1	Understand the working culture and environment of the Industry and get familiar with various departments and practices in the industry.				
CO2	Operate various meters, measuring instruments, tools used in industry efficiently and develop technical competence.				
CO3	Apply internship learning in other course completions and final year project management, i.e. topic finalization, project planning, hardware development, result interpretations, report writing, etc.				
CO4	Create a professional network and learn about ethical, safety measures, and legal practices.				
CO5	Appreciate the responsibility of a professional towards society and the environment.				
CO6	Identify career goals and personal aspirations.				
Guidelines: The guidelines related to the internship are given below.					
Duration: Guidelines related to duration are as follows.					
<ol style="list-style-type: none"> 1. The internship should be started after semester 5 and should be completed before the commencement of semester 6. 2. It should be for at least 4 to 6 weeks. 3. It should be assessed and evaluated in semester 6. 					
2. Internship Identification:					
A student may choose to undergo an Internship at Industries, Government organizations, NGOs, Micro-Small-Medium enterprises, startups, Innovation and Incubation Centers, Institutes of National interests, organizations working for rural development, organizations promoting IPR and Entrepreneurship, etc. Approaching various industries for Internships and finalizing the same should be initiated in the 5 th semester in consultation with Institute's Training and Placement Cell, Industry-Institute Cell, or Internship Cell. This will help students to start their internship work on time. Also, it will allow students to work in a vacation period after their 5 th -semester examination and before the start of the 6 th semester. Student can take internship work in the form of Online/Onsite work from any					

303153A: Audit Course IV: Ethical Practices for Engineers						
Teaching Scheme			Credits		Examination Scheme	
Theory	02	Hr/Week	TH	00	GRADE	PP/NP
Prerequisite:						
Basic understanding of business management						
Course Objectives: This course aims to						
Create awareness to serve the public by strictly adhering to codes of conduct and placing paramount the health, safety and welfare of public.						
Course Outcomes: At the end of this course, student will be able to						
CO1	Understand for their professional responsibilities as Engineers.					
CO2	Recognize and think through ethically significant problem situations that are common in Engineering.					
CO3	Evaluate the existing ethical standards for Engineering Practice.					
Unit 01	Introduction: Justice and Moral					12 hrs
Introduction to Ethical Reasoning and Engineer Ethic, Professional Practice in Engineering, Ethics as Design - Doing Justice to Moral Problems, Central Professional Responsibilities of Engineers.						
Unit 02	Rights and Responsibility					12 Hrs
Computers, Software, and Digital Information, Rights and Responsibilities Regarding Intellectual Property, Workplace Rights and Responsibilities, Responsibility for the Environment.						
Test Books:						
[T1]	Ethics in Engineering practice and Research (2nd Edition) by Caroline Whitbeck Cambridge					
[T2]	Ethics in Engineering MW Martin and R Schinzinger MC Graw Hill					
[T3]	Engineering Ethics and Environment P a Vesilind and AS Gunn Cambridge					
Online Resources:						
[O1]	NPTEL course on "Ethics in Engineering Practice", By Prof. Susmita Mukhopadhyay, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc19_hs35/preview					

303146: Seminar

Teaching Scheme			Credits		Examination Scheme	
SEM	01	Hr/Week	SEM	01	TW	50 Marks

Course Objectives:

1. Gaining of actual knowledge (terminology, classification, methods and advanced trends)
2. Learning fundamental principles, generalization or theories.
3. Discussion and critical thinking about topics of current intellectual importance.
4. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to the course.

Course Outcomes: At the end of this course, student will be able to

- | | |
|-----|--|
| CO1 | Relate with the current technologies and innovations in Electrical engineering. |
| CO2 | Improve presentation and documentation skill |
| CO3 | Apply theoretical knowledge to actual industrial applications and research activity. |
| CO4 | Communicate effectively. |

Seminar should be based on a detailed study of any topic related to the advance areas/applications of Electrical Engineering. Topic should be related to Electrical Engineering. However, it must not include contents of syllabus of Electrical Engineering. It is expected that the student should collect the information from journals, internet and reference books in consultation with his/her teacher/mentor, have rounds of discussion with him/her. The report submitted should reveal the student assimilation of the collected information. Mere compilation of information from the internet and any other resources is discouraged.

Format of the Seminar report should be as follows:

1. The report should be neatly typed on white paper. The typing shall be with normal spacing, Times New Roman (12 pt) font and on one side of the paper. (A-4 size).
 2. Illustrations downloaded from internet are not acceptable.
 3. The report should be submitted with front and back cover of card paper neatly cut and bound together with the text.
 4. Front cover: This shall have the following details with Block Capitals
 - a. Title of the topic.
 - b. The name of the candidate with roll no. and Exam. Seat No. at the middle.
 - c. Name of the guide with designation below the candidate's details.
 - d. The name of the institute and year of submission on separate lines at the bottom.
 5. Certificate from institute as per specimen, Acknowledgement and Contents.
 6. The format of the text of the seminar report should be as follows
 - I. The introduction should be followed by literature survey.
 - II. The report of analytical or experimental work done, if any.
 - III. The discussion and conclusions shall form the last part of the text.
 - IV. They should be followed by nomenclature and symbols used.
 - V. The Reference Books are to be given at the end.
 7. The total number of typed pages, excluding cover shall from 20 to 25 only.
 8. All the pages should be numbered.
 9. Two spiral bound copies of the seminar report shall be submitted to the college.
 10. Candidate shall present the seminar before the examiners.
 11. The total duration of presentation and after-discussion should be about 30 minutes.
- The assessment for the subject shall be based on:
1. Content. 2. Presentation 3. Report

303141: Industrial and Technology Management						
Teaching Scheme			Credits		Examination Scheme	
Theory	03	Hr/Week	TH	03	ISE	30 Marks
					ESE	70 Marks
Course Objectives: This course aims to						
<ul style="list-style-type: none"> • Possess knowledge of types of business organizations. • Explore the fundamentals of Industrial economics and Management. • Understand the basic concepts of Technology management and Quality management. • Analyze and differentiate between marketing management and financial management. • Recognize the importance of Motivation, Group dynamics, Teamwork, leadership skill and entrepreneurship. • Explain the fundamentals of Human Resource management. • Identify the importance of Intellectual property rights and understand the concept of patents, copy rights and trademarks. • Software programming to construct and use simple mathematical model. • Ability to carry out basic manufacturing and testing procedure. 						
Course Outcomes: At the end of this course, student will be able to						
CO1	Differentiate between different types of business organizations and discuss the fundamentals of economics and management.					
CO2	Explain the importance of technology management and quality management.					
CO3	Explain the importance of IPR and role of Human Resource Management.					
CO4	Understand the importance of Quality and its significance.					
CO5	Describe the characteristics of marketing & its types and overview of financial Management.					
CO6	Discuss the qualities of a good leader and road map to Entrepreneurship.					
Unit 01	Introduction to Management and Economics					07 hrs
<p>A) Management: Meaning, scope, function, and importance of management. Difference between administration and management.</p> <p>B) Industrial Economics: Definition of economics, Demand and Supply concept, Demand Analysis. Types of Demand, Determinants of Demand, Law of demand and supply, Elasticity of demand and supply, Law of Diminishing Marginal utility, Demand forecasting: Meaning and methods.</p> <p>C) Business Organizations: Line organization, Staff organization and Functional Organization, (Project, Matrix, Committee Organization.)</p> <p>D) Business Ownership and its Types: Types of business ownership, Sole proprietorship, Partnership (Act 1934), LLP (Limited Liability Partnership) (Act 2008). One person company, Joint Stock Company: Public Limited and Private Limited, Public Sector Undertaking (PSU).</p>						
Unit 02	Technology Management					05 hrs
<p>A) Technology Management: Definition of technology Management and its relation with society, development, application and its scope.</p> <p>B) Classification of Technology Management: Classification of technology management at various levels- its importance on National Economy, Ethics in technology management, Critical factors in technology management.</p>						
Unit 03	Intellectual Property Rights (IPR) & Human Resource Management (IIRM)					06 hrs
<p>A) Introduction to Intellectual Property Rights (IPR): Meaning of IPR, Different forms of IPR, Patents, Criteria for securing Patents. Patent format and structure, Copy rights and trademark (Descriptive treatment only).</p> <p>B) Human Resource Management: Introduction, importance, scope, HR planning, Recruitment, selection, training and development, Performance management.</p>						

Savitribai Phule Pune University
FACULTY OF ENGINEERING

B.E. Electrical Engineering (2015 Course)
(w.e.f. 2018-2019)

SEMESTER-I													
Sr No	Subject Code	Subject Title	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)					Total Marks	Credit	
			TH	PR	TU	PP		TW	PR	OR		TH / TU	PR + OR
						In Sem	End Sem						
1	403141	<u>Power System Operation and Control</u>	03	02	--	30	70	25	--	25	150	03	01
2	403142	<u>PLC and SCADA Applications</u>	04	02	--	30	70	25	50	--	175	04	01
3	403143	<u>Elective I</u>	03	02	--	30	70	25	--	--	125	03	01
4	403144	<u>Elective II</u>	03	--	--	30	70	--	--	--	100	03	--
5	403145	<u>Control System II</u>	03	02	--	30	70	25	--	25	150	03	01
6	403146	<u>Project I</u>	--	--	02	--	--	--	--	50	50	02	--
	403152	<u>Audit Course V</u>											
TOTAL			16	08	02	150	350	100	50	100	750	18	04

SEMESTER-II													
Sr No	Subject Code	Subject Title	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)					Total Marks	Credit	
			TH	PR	TU	PP		TW	PR	OR		TH / TU	PR + OR
						In Sem	End Sem						
1	403147	<u>Switchgear and Protection</u>	03	02	--	30	70	50	--	25	175	03	01
2	403148	<u>Power Electronic Controlled Drives</u>	04	02	--	30	70	25	50	--	175	04	01
3	403149	<u>Elective III</u>	03	02	--	30	70	25	--	25	150	03	01
4	403150	<u>Elective IV</u>	03	--	--	30	70	--	--	--	100	03	--
5	403151	<u>Project II</u>	--	--	06	--	--	50	--	100	150	06	--
	403153	<u>Audit Course VI</u>											
TOTAL			13	06	06	120	280	150	50	150	750	19	03

Elective II : 403144 (D) : Electric and Hybrid Vehicles

Teaching Scheme	Credits	Examination Scheme [100 Marks]	
Theory : 03 Hr/Week	03	In Sem : 30 Marks	
		End Sem : 70 Marks	

Prerequisite: Basic concept of Batteries, Electrical motors, Power electronic conversion

Course Objective: The course aims:-

- To make students aware the need and importance of Electric, Hybrid Electric Vehicles and Fuel cell vehicle.
- To differentiate and analyze the various energy storage devices and battery charging and management systems.
- To impart knowledge about architecture and performance of Electric and Hybrid Vehicles
- To classify the different drives and controls used in electric vehicles.

Course Outcome: Upon successful completion of this course, the students will be able to:-

1. Review history, **Social and environmental importance of Hybrid and Electric vehicles.**
2. Describe the performance and selection of energy storage systems and Analyze battery management system.
3. Distinguish between the performance and architecture of various drive trains.
4. Describe the different Instrumentation and Control used for electric vehicles.
5. Differentiate between Vehicle to Home, **Vehicle to Vehicle and Vehicle to Grid energy systems concepts.**

Unit 01 : Introduction (05 Hrs)

Conventional Vehicle: Basic of Vehicle performance, vehicle power source characterization, transmission characterization. Need and importance of transportation development. History of Electric Vehicle, Hybrid Electric Vehicle and Fuel cell Vehicle. Social and environmental importance of Hybrid and Electric vehicles. Impact of modern drive-trains on energy supplies.

Unit 02 : Energy Storage Systems (07 Hrs)

Introduction to energy storage requirements in Hybrid and Electric vehicles, battery-based energy storage and its analysis, Fuel cell based energy storage and its analysis, Ultra capacitor based energy storage and its analysis, flywheel based energy storage and its analysis. Hybridization of energy sources for Hybrid and Electric vehicle: - Hybridization of drive trains in HEVs, Hybridization of energy storage in EVs. Selection of energy storage technology.

Unit 03 : Battery charging and Management systems (06 Hrs)

Introduction, charging algorithm, balancing method for battery pack charging. Battery management system representation: - battery module, measurement unit block, battery equalization balancing unit, MCU estimation unit, display unit, fault warning block. SoC and SoH, estimation of SoC, battery balancing, Thermal monitoring of Battery unit.

Unit 04 : Hybrid and Electric vehicles (05 Hrs)

Electric vehicles: - Components, configuration, performance, tractive efforts in normal driving, Advantages and challenges in EV design. Hybrid Electric vehicles: - Concept and architecture of HEV drive train (Series, parallel and series-parallel). Energy consumption of EV and HEV

403143 (C) : Renewable Energy Systems

Teaching Scheme	Credits	Examination Scheme [125 Marks]
Theory : 03 Hr/Week	03	In Sem : 30 Marks
Practical : 02 Hr/Week	01	End Sem : 70 Marks
		Term work : 25 Marks

Prerequisite: Knowledge of basic renewable technologies like solar, wind, biogas, fuel cell, Knowledge of conventional grid

Course Objective: The course aims:-

- To develop fundamental understanding about Solar Thermal and Solar Photovoltaic systems.
- To provide knowledge about development of Wind Power plant and various operational as well as performance parameter/characteristics.
- To explain the **contribution of Biomass Energy System in power generation.**
- To describe different Storage systems, Integration and Economics of Renewable Energy System.

Course Outcome: Upon successful completion of this course, the students will be able to :-

1. Describe various renewable energy sources such as Solar Photovoltaic, Biomass, Wind, Fuel cell and Solar thermal.
2. Explain **different renewable energy sources as an alternate for conventional power sources in any application of energy.**
3. Identify and locate the **use of renewable energy sources** as per the requirement of the location.
4. Analyze, assess and design renewable energy systems such as solar and wind sources.
5. Compare the various storage sources for electrical energy.
6. Describe the standards for renewable energy source integration and evaluate economics related to these sources.

Unit 01 : Solar Thermal

(06 Hrs)

Solar radiation at the Earth's surface, solar constant, spectral distribution, Extra-terrestrial radiation, solar terrestrial radiation, solar radiation geometry, Introduction to the concept of monthly average daily and hourly global and diffuse radiation, beam and diffuse radiation under cloudless skies, solar radiation on tilted surfaces: a) beam radiation, b) diffuse radiation, c) reflected radiation, d) flux on tilted surface.

Instruments for measuring solar radiation, Basics of flat plate collector, concepts of solar water heating system and space heating system, solar dryer, introduction to Concentrating Solar Power (CSP) plants using technologies like a) parabolic troughs b) linear Fresnel reflector c) paraboloid dish

Unit 02 : Solar PV

(06 Hrs)

Introduction to various solar PV technologies, Single c-Si, Poly c-Si, thin film PV Cell, Module and Array, factors influencing the electrical design of the solar system: a) Sun Intensity b) Sun Angle c) Shadow Effect d) Temperature Effect e) Effect of Climate f) Electrical Load Matching g) Sun Tracking; Peak Power Point Operation, Electrical characteristics of Silicon PV Cells and Modules, PV System Components, Efficiency of PV system.

Design of typical solar PV system with and without battery backup for applications such as homes, commercial complex, agriculture etc.

403146 : Project I

Teaching Scheme	Credits	Examination Scheme [50 Marks]
Tutorial : 02 Hr/Week	02	Oral : 50 Marks

The student shall take up a project in the field closely related to Electrical Engineering. Preferably, group of 3/4 students should be formed for project work.

The project work should be based on the knowledge acquired by the student during the graduation and preferably it should meet and contribute towards the needs of the society. The project aims to provide an opportunity of designing and building complete system or subsystems based on area where the student likes to acquire specialized skills.

Project work in this semester is an integral part of the complete project. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview and scheme of implementation. As a part of the progress report of project work, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected project topic.

Guidelines for VIIth Semester for Project work:

1. To identify the problems in industry and society.
2. Perform Literature survey on the specific chosen topic through research papers, Journals, books etc. and market survey if required.
3. To narrow down the area taking into consideration his/her strength and interest. The nature of project can be analytical, simulation, experimentation, design and validation.
4. **Define problem, objectives, scope and its outcomes.**
5. Design scheme of implementation of project.
6. Data collection, simulation, design, hardware if any, needs to be completed.
7. Presentation based on partially completed work.
8. Submission of report based on the work carried out.
9. Student should maintain Project Work Book.

403151: Project II

Teaching Scheme	Credits	Examination Scheme [150 Marks]
Tutorial : 06 Hrs./Week	06	Oral : 50 Marks Term work : 100 Marks

Course Objectives:

- To explore and to acquire specified skill in areas related to Electrical Engineering
- To develop skills for carrying literature survey and organize the material in proper manner.
- To provide opportunity of designing and building complete system/subsystem based on their knowledge acquired during graduation.
- To understand the needs of society and based on it to contribute towards its betterment and to learn to work in a team.
- To ensure the completion of given project such as fabrication, conducting experimentation, analysis, validation with optimized cost.
- Present the data and results in report form
- **Communicate findings of the completed work systematically.**

Course outcomes: Students will be able to

- Work in team and ensure satisfactory completion of project in all respect.
- Handle different tools to complete the given task and to acquire specified knowledge in area of interest.
- Provide solution to the current issues faced by the society.
- Practice moral and ethical value while completing the given task.
- Communicate effectively findings in verbal and written forms.

Guidelines :

The student shall complete the remaining part of the project which is an extension of the work carried out in VIIth Semester. For exceptional cases, change of topic has to be approved by Internal Assessment Committee consisting of Guide, Project Coordinator and Head of Department.

Student should incorporate suggestions given by examiner in project I.

The student shall complete the remaining part of the project which consists of design, simulation, fabrication of set up required for the project, analysis and validation of results and conclusions.

The student shall prepare duly certified final report of the project work in the standard format in MS Word / LaTeX.

Student should maintain Project Work Book.

403153A: German Language-II

Teaching Scheme			Credits		Examination Scheme		
Theory	02	Hrs/Week	Theory	-	ISE		-
Course Objectives:							
This course aims to: <ul style="list-style-type: none"> Get introduced to the Culture, Routine of the German Society through language. Meet the needs of ever growing German industry with respect to language support. 							
Course Outcomes:							
At the end of this course, students: CO1: Will have the ability of advanced communication. CO2: Will develop reading, writing and listening skills . CO3: Will understand tenses in German Language. CO4: Will develop interest to pursue a German language course.							
Unit 01	Introduction of Cases:					06 hrs	
Introduction of Cases: Nominative, Akkusative, Dative. Personal & Possessive Pronouns in Nominative, Akkusative, Dative.							
Unit 02	Prepositions:-					06 hrs	
Prepositions:- Akkusative & Dative.							
Unit 03	Tenses:-					06 hrs	
Tenses:- Past tense of sein & haben Verbs, Perfect tense							
Text Books:							
[T1]	Netzwerk A-1 (Deutsch als Fremdsprache), Goyal Publishers & Distributors Pvt. Ltd.						
Reference Books:							
[R1]	Tipps und Uebungen A1						
Online Resources:							
[O1]	Practice Material like online Worksheets regarding the Grammar, listening Module, reading Texts.						

BE Electrical (2019 Course)

SEM-I

Course Code	Course Name	Teaching Scheme				Examination Scheme						Credit				
		Th	Pr	Tu	PW	ISE	ESE	TW	PR	OR	Total	Th	Pr	Tu	PW	Total
403141	Power System Operation & Control	3	2	-	-	30	70	25	-	25	150	3	1	-	-	4
403142	Advanced Control System	3	2	-	-	30	70	-	-	50	150	3	1	-	-	4
403143	Elective-I	3	2	-	-	30	70	-	-	25	125	3	1	-	-	4
403144	Elective-II	3	-	2*	-	30	70	25	-	-	125	3	-	1	-	4
403145	Project Stage-I	-	-	-	4	-	-	50	-	50	100	-	-	-	2	2
403146	MOOCs	-	-	-	-	-	-	50	-	-	50	-	-	-	2	2
403147	Audit Course-VII	2#	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		12	6	2	4	120	280	150	-	150	700	12	3	1	4	20
403143: Elective-I				403144: Elective-II						403147: Audit Course-VII						
403143A: PLC and SCADA 403143B: Power Quality Management 403143C: High Voltage Engineering 403143D: Robotics and Automation				403144A : Alternate Energy System 403144B : Electrical & Hybrid Vehicle 403144C : Special-purpose Machines 403144D: HVDC & FACTS						403147 A: German Language I 403147B: Engineering Economics I 403147C: Sustainability(IGBC)						

SEM-II

Course Code	Course Name	Teaching Scheme				Examination Scheme						Credit				
		Th	Pr	Tu	PW	ISE	ESE	TW	PR	OR	Total	Th	Pr	Tu	PW	Total
403148	Switchgear and Protection	3	2	-	-	30	70	25	-	50	175	3	1	-	-	4
403149	Advanced Electrical Drives & Control	3	2	-	-	30	70	25	50	-	175	3	1	-	-	4
403150	Elective-III	3	-	-	-	30	70	-	-	-	100	3	-	-	-	3
403151	Elective-IV	3	-	-	-	30	70	-	-	-	100	3	-	-	-	3
403152	Project stage II	-	-	-	12	-	-	100	-	50	150	-	-	-	6	6
403153	Audit course VIII	2#	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		12	4	-	12	120	280	150	50	100	700	12	2	-	6	20
403150: Elective-III				403151: Elective-IV						403153: Audit Course-VIII						
403150 A : Digital Control System 403150 B : Restructuring and Deregulation 403 150 C: Smart Grid 403150 D: SensorTechnology (Open Elective)				403151A: EHV AC Transmission 403151B : Illumination Engineering 403151C: Electromagnetic Fields 403151D: AI and ML (Open Elective)						403153A: German Language II 403153B: Engineering Economics II 403153C: Green Building						

403144B: Electric and Hybrid Vehicle

Teaching Scheme			Credits		Examination Scheme	
Theory	03	Hrs/Week	Theory	03	ISE	30
Tutorial	02	Hrs/Week/Batch	Tutorial	01	ESE	70
					Term work	25

Course Objectives:

This course aims to:

1. To gain knowledge of Li-ion battery protection.
2. To learn HEV Subsystems and Configurations.
3. To understand Mathematical Model of Li-ion battery.
4. To familiarize with Hybridization of drivetrains.
5. To learn Star Labeling Schemes for Li-ion Packs.

Course Outcomes:

At the end of this course, students will be able to:

- CO1: Analyze the Life Cycle Assessment of Li-ion battery.
 CO2 : Describe the different types of Li-ion charging methods
 CO3 : Comprehend the knowledge of drivetrain hybridization.
 CO4 : Evaluate EV motor sizing.
 CO5 : Classify Battery Recycling methods.

Unit 01	Li-ion Battery	07 hrs
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Materials used for Li-ion battery, Nanostructured Electrode Materials for Li-Ion Batteries, Li-ion battery protection, Wireless charging of EV, Life Cycle Assessment of Li-ion battery, Solid-state Battery, Panasonic 18650 & 2170 cell,

Unit 02	Battery Charging and Modelling	07 hrs
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TSCC/CV charging and CVCC/CC charging of Li-Ion battery, BMS standards, SoC Estimation methods (Kalman Filter, Neural Network, Fuzzy logic), Public EV charging stations, Solar Powered Charging Stations, Modeling of Lithium-ion batteries, Thermal Modeling of Li-ion battery.

Unit 03	Electric Vehicle Technologies	07 hrs
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Battery Swapping System, EV Fleet Management, Sensors for Electric Vehicles
 Electric bus, Electric trucks, Fuel cell vehicles, Introduction of EV Subsystems and Configurations, Energy management strategies and its general architecture.

Unit 04	Plug-In Hybrid Electric Vehicles	07 hrs
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Hybridization of drivetrains in HEVs, Hybridization of energy sources in EVs, Power Flow control in hybrid drive train topologies. Power Management Strategies in HEV. Introduction of HEV Subsystems

403145: Project Stage I

Teaching Scheme			Credits		Examination Scheme	
SEM/P W/IN	4	Hrs./Week	SEM/PW/IN	2	ORAL	50
					Term work	50

Preamble:

Project is an important part of the engineering curriculum covered in the final year. It is divided into Project Stage I and Project Stage II at Semesters I and II of the Final Year. This project is a substantial piece of work that will require creative activity and original thinking. The project aims to provide students with a transitional experience from the academic world to the professional world. The objectives, outcomes, and guidelines for Project Stage I are given below.

Course Objectives:

The objectives of this course are to:

1. Provide an opportunity to learn new software, interdisciplinary theory, concepts, technology, etc. not covered in earlier subjects.
2. Empower students to use engineering knowledge and skills learned in previous courses to deliver a product that has passed through the design, analysis, testing, and evaluation.
3. Encourage multidisciplinary project work through the integration of knowledge.
4. Allow students to develop problem-solving, analysis, synthesis, and evaluation skills.
5. Encourage teamwork.
6. Improve students' communication skills by asking them to produce both a professional report and to give an oral presentation.

Course Outcomes:

Course outcomes can be different for the different projects undertaken by the student groups. However, in general, the course outcomes for Project Stage-I can be stated as follows.

At the end of this course, students should be able to:

CO1: Define the project problem statement and identify the scope of the project.

CO2: Search the appropriate research papers, standards and e-resources and write a literature survey.

CO3: Identify tools, techniques, methods, concepts, measuring devices, and instruments required for the project to define the methodology of the project.

CO4: Justify the selection of electrical, electronic and mechanical components for the project prototyping

CO5: Simulate or develop a system for software or hardware verification.

CO6: Write a project report with proper interpretation of results.

Guidelines for students:

1. Form a group of 3-4 students.
2. Select a project problem statement based on an industrial or societal issue and ideate on it.
3. Research on the project topic through existing theories, literature, technology, patents, etc.
4. Define objectives, scope, and outcomes of the project in the 1st presentation.
5. Maintain a notebook to keep records of all the meetings, discussions, notes, etc. This is to be done by the individual student

403152: Project Stage II

Teaching Scheme			Credits		Examination Scheme	
SEM/P W/IN	12	Hrs./Week	SEM/PW/IN	6	ORAL	50
					Termwork	100

Preamble:

Project is an important part of the engineering curriculum covered in the final year. It is divided into Project Stage I and Project Stage II in Semesters I and II of the Final Year. This project is a substantial piece of work that will require creative activity and original thinking. The project aims to provide students with a transitional experience from the academic world to the professional world. The objectives, outcomes, and guidelines for Project Stage II are given below.

Course Objectives:

The objectives of this course are to:

1. Provide an opportunity to learn new software, interdisciplinary theory, concept, technology, etc. not covered in earlier subjects
2. Empower students to use engineering knowledge and skills learned in previous courses to deliver a product that has passed through the design, analysis, testing, and evaluation
3. Encourage multidisciplinary project work through the integration of knowledge
4. Allow students to develop problem-solving, analysis, synthesis, and evaluation skills.
5. **Encourage teamwork.**
6. Improve **students' communication skills by asking them to produce both a professional report and to give an oral presentation**
7. Exposed to the **project management skills and ethical practices in project**

Course Outcomes:

Course outcomes can be different for the different projects undertaken by the student groups. However, in general, the course outcomes for Project Stage-II can be stated as follows.

At the end of this course, students should be able to:

- CO1: Identify tools, techniques, methods, concepts, measuring devices, and instruments required for the project to define the methodology of the project
- CO2: Justify the selection of electrical, electronic and mechanical components for the project prototyping
- CO3: Select the appropriate testing method for system performance evaluation
- CO4: Interpret results obtained by simulation, and hardware implementation and decide on further action or write a conclusion
- CO5: Write a project report and research paper on the project work

Guidelines:

Termwork evaluation guidelines are given below.

Sr. No.	Activity	Deadline (Semester II)	Parameters for Evaluation
1	Progress Review- 3 Presentation	Up to 6 th Week	Revised Final Design (10) Tools and Techniques Used with justification (10) Partial Implementation/ development (15)

403147C: Sustainability

Teaching Scheme			Credits		Examination Scheme		
Theory	02	Hrs/Week	Theory	–	ISE		–

Course Objectives:

This course aims to:

- Increase awareness among students about sustainability.
- Understand role of engineering and technology within sustainable development.

Course Outcomes:

At the end of this course, students will be able to:

CO1: Understand different types of environmental pollution problem.

CO2: Suggest solutions for sustainable development.

CO3: Develop a broader perspective in thinking for sustainable practices by utilizing engineering principle and knowledge

Unit 01	Sustainability Introduction		11 hrs
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Introduction, need and concept of sustainability, social, environmental and economical sustainability concepts, sustainable development, 17 goals defined by UN, Nexus between technology and sustainable development and its challenges, multilateral environmental agreements and protocols-CDM, Environmental legislations in India-Water Act, Air Act. Air, water and solid waste pollution sources and impacts, Sustainable water treatment. Zero waste concept. Global environmental issues, climate change, global warming, ozon layer depletion.

Unit 02	Sustainable Solution		11 hrs
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Carbon credits and trading, carbon foot print, Green engineering, sustainable urbanization, industrialization and poverty reduction, Industrial process: Material selection, pollution preventions, industrial ecology and symbiosis, Global institutions: UNEP, IPCC, UNDP, WHO, Kyoto protocols. Certification and labelling in energy and carbon: Energy Star, Compliance and voluntary carbon credits, Green-e. Tools and techniques: ISO 14001, ISO26000, ABCD planning method. Assessment measurement: Indicators, F2B2, LCA, LCC, ROI.

Text Books:

[T1]	Allen D. T. and Shonnard D. R. "Sustainable Engineering: Concept design and case studies", Prentice hall
[T2]	Environmental Impact Assessment Guidelines, Notification of Government of India 2006
[T3]	Mackenthun K. M. "Basic Concept of Environmental Management", Lewis publication London 1998
[T4]	ECBC code 2007 BEE, New Delhi; BEE publication, TERI publication