Savitribai Phule Pune University

Syllabus: Secoud 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

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203152 : Audit Course-III

List of three audit course is provided. Students can choose any one from 203152(A) 203152(B) and 203152(C)

203152 (A) : Solar Thermal System

Teaching Scheme Lectures: 2hrs/week	Credits No credit	Examination Scheme [Marks] Grade: PP/NP Quiz and 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 first-hand 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

CO1: Differentiate between types of solar Concentrators

CO2: Apply software tool for solar concentrators

CO3: 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
- Typical financial analysis of CSP
- Software tools for concentrating solar power
- Environmental impact assessment
- Standards and certification for CSP
- Basics of solar thermal (STH) systems
- Elements of various STH systems
- Design, materials and manufacturing of
  - Flat plate solar collector
  - Evacuated tube solar collector
  - Parabolic trough collector
  - Dish type solar concentrators
  - Concentrating PV systems
  - Balance of plant

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203153: Audit Course-IV

List of three audit course is provided. Students can choose any one from 203153(A) 203153(B) and 203153(C)

203153(A): Solar Photovoltaic System

Teaching Scheme Lectures: 2hrs/week	Credits No credit	Examination Scheme [Marks] Grade: PP/NP Quiz and term paper

Prerequisite: Completion of FE or equivalent

Description: The course will introduce the basics of: solar energy, availability, semiconductors as photovoltaic convertors and solar cells, applications of photovoltaic, various types of solar photovoltaic systems, and introduction to manufacturing of the systems, characterization, quality assurance, standards, certification and economics. The following topics may be broadly covered in the classroom. The practical will be designed for basic understanding of the system elements.

Course Objective:

- To learn Solar PV system and its appliances
- To get knowledge of balance of PV system, batteries, inverters etc.
- To understand grid tied SPV solar plants

Course Outcome: Students will be able to

CO1: design of Solar PV system for small and large installations

CO2: handle software tools for Solar PV systems

Course Contents:

- Physics of photovoltaic (PV) electricity
- Photodiode and solar cell
- Solar radiation spectrum for PV •
- Types of solar cell and comparison
- Introduction to various types of solar module manufacturing
- Basic system design and economics
- Types of systems
- Common applications of solar PV
- Introduction to solar PV (SPV) systems
- SPV appliances
- Small capacity SPV power plants
- Grid tied SPV power plants
- Large scale SPV power plants
- Balance of system
- Solar inverters
- Batteries
- Financial modelling of SPV
- Operation and maintenance of SPV
- Software tools for SPV
- Environmental impact assessment
- Standards and certification for SPV
- Basics of SPV systems
- Elements of SPV appliances and power plants 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

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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 In Sem	PP End Sem	TW	PR	OR		TH/ TU	PR+OR
1	311121	Industrial and Technology Management	03	--	--	30	70	--	--	--	100	03	--
2	303141	Advance Microcontroller and its Applications	04	02	--	30	70	--	--	50	150	04	01
3	303142	Electrical Machines II	04	02	--	30	70	--	50	--	150	04	01
4	303143	Power Electronics	04	02	--	30	70	--	50	--	150	04	01
5	303144	Electrical Installation, Maintenance and Testing	03	02	--	30	70	50	--	--	150	03	01
6	303145	Seminar and Technical Communication	--	02	--	--	--	50	--	--	50	--	01
	303152	Audit Course III											
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 In Sem	PP End Sem	TW	PR	OR		TH/ TU	PR+OR
1.	303146	Power System II	04	02	--	30	70	--	50	--	150	04	01
.	303147	Control System I	04	02	--	30	70	-	--	50	150	04	01
3.	303148	Utilization of Electrical Energy	03	--	--	30	70	--	--	--	100	03	--
4.	303149	Design of Electrical Machines	04	02	--	30	70	25	--	50	175	04	01
5.	303150	Energy Audit and Management	03	02	--	30	70	25	--	--	125	03	01
6.	303151	Electrical Workshop	--	02	--	--	--	50	--	--	50	--	01
	303153	Audit Course IV											
Total			18	10	--	1S0	3S0	100	50	100	750	18	0S

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

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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 go 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

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SE(Civil Engineering) 2019 Course
(With effect from Academic Year 2020-21)
Semester-III

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
201001	Building Technology and Architectural Planning	03	-	-	30	70	--	-	-	100	03	--	--	03
201002	Mechanics of structure	03	-		30	70		-	-	100	03	-	-	03
201003	Fluid Mechanics	03	-	-	30	70	-	-	-	100	03	-	-	03
207001	Engineering Mathematics III	03	--	--	30	70	--	--	--	100	03		--	03
207003	Engineering Geology	03	-	-	30	70	-	-	-	100	03	-	-	03
201004	Building Technology and Architectural Planning **Lab**	-	04	-	-	-	50		-	50	-	02	-	02
201005	Mechanics of structure **Lab**	-	04	-	-	-	-	-	50	50	-	02	-	02
201006	Fluid Mechanics **Lab**	-	02	-	-	-	-		50	50		01		01
207002	Engineering Mathematics III **Tutorial**	--	--	01	--	--	25	--	--	25	--		01	01
207004	Engineering Geology **Lab**	-	02	-	-	-	25		-	25	-	01	-	01
201007	**Audit Course I Awareness to civil Engineering Practices / Road Safety Management / Foreign Language**	–	01	-	-	Grade	-	-	-	Grade	--	--	-	--
Total		15	13	01	150	350	100	--	100	700	15	06	01	22

Abbreviations:
H : Theory TW: Term Work PR : Practical OR: Oral TUT : Tutorial

Note: Interested students of S.E. (Civil) can opt any one of the audit course from the list of audit courses prescribed hy BoS (Civil Engineering)

Note: The Underlined portion of the syllabus will be covered by video lectures/ on-line lectures/ flip classroom, self study, NPTEL course lecture and/or using relevant ICT technique

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Savitribai Phule Pune University, Pune

Second Year Civil Engineering (2019 Pattern)

Awareness to Civil Engineering Practices

Audit Course I

Teaching Schemc:

Practical: 01 hrs/week

(Certificate to be issued by institute based on performance assessment)

Civil Engineering is the oldest engineering profession comprising of a variety of sub-disciplines such as Structural Engineering, Geotechnical, Water resources, Environmental Engineering, Construction technology, Transportation Engineering etc. Undergraduate programs are designed with different theoretical approaches on the application of basic sciences to solve different societal problems by engineering knowledge. However, there is a need to make the students aware about how the Civil Engineering industry operates and how theories taught in different courses are applied in practice. The students can learn from the experience gained from different workplaces such Civil Engineering consultancies, contracting companies, construction sites etc. The course aims to provide insight of the different practices followed by the industry such as use of different documents & contracts in Civil Engineering practice, drawings required, engineering ethics, duties and responsibilities of the engineers, site records and diaries, health and safety practices on site.

Course Objectives:

1. To provide basic overview of functioning of different Civil Engineering related industries / firms.
2. To create awareness about application of different drawings, contract documents in Civil Engineering.
3. To provide insight of code of ethics, duties and responsibilities, health and safety as a Civil Engineer.

Course Ontcomes:

On completion of the course, learner will be able to…

CO1: Describe functioning/working of different types of industries/sectors in Civil Engineering.

CO2: Describe drawings and documents required and used in different Civil Engineering works.

CO3: Understand the importance of Code of Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.

CO4: Understand different health and safety practices on the site.

Course Contents (During 1hr. Practical Session per week)

Unit I: Sectors in Civil Engineering **(03 Hours.)**

Details of different Sectors/sub-disciplines in Civil Engineering along with the following details: description, eminent institutes in India & abroad, related research institutes, noteworthy projects, higher education, latest & ongoing research in the domain, jobs opportunities in government as well as private sector.

Suggestion for effective content delivery:

Lecture cum interaction by alumni of your college working in different sectors of Civil Engineering

Unit II: Drawings and Documents **(03 Hours.)**

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Types of drawings in different construction projects. Contract agreement & other documents in different construction projects.

Suggestion for effective content delivery:

i.] Visit to various construction sites/ architectural firms/ structural engineering firms etc. to understand drawings, documents & working culture.

ii.] Lecture by professional practitioner

Unit III: Engineering Ethics **(03 Hours.)**

Introduction, moral issues and moral dilemmas. Code of ethics in Civil Engineering followed by Construction Industry Development Council (CIDC) of India, national & international associations and institutes. Effective case studies (Minimum 2 case studies).

Suggestion for effective content delivery:

Case study based content delivery menthod, Lecture by professional practitioner

Unit IV: Construction Site Safety **(03 Hours.)**

Importance of site safety. Different health and safety parameters during actual execution of Civil Engineering constructions. Safety measures: conventional and modern.

Suggestion for effective content delivery:

On site visit & lecture by professional practicing Safety Engineer.

Guidclines for Assessment (Any one or more of following bnt not limited to)

1. Group discussion
2. Presentation
3. Mini Project / Activity
4. Site visit report
5. Guest lecture report

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Second Year Civil Engineering (2019 Pattern)

Road Safety Management

Audit Course 1

Teaching Scheme:

Practical: 01 hrs/week

(Certificate to be issued by institute based on performance assessment)

Road transport remains the least safe mode of transport, with road accidents representing the main cause of death of people. The boom in the vehicle population without adequate road infrastructure, poor attention to driver training and unsatisfactory implementation of regulations have been responsible for increase in the number of accidents. India's vehicle population is negligible as compared to the world statistics; but the comparable proportion for accidents is substantially large. The need for strict enforcement of law to ensure greater safety on roads and an environment-friendly road transport operation is of paramount importance. Safety and security are growing concerns for businesses, governments and the traveling public around the world, as also in India. It is, therefore, essential to take new initiatives in raising awareness, skill and knowledge of students as one of the important stake holders who are expected to follow the rules and policies of the government in order to facilitate safety of individual and safe mobility of others.

Course Objectives:

1. To provide basic overview on road safety & traffic management issues in view of the alarming increase in vehicular population of the country.
2. To explain the engineering & legislative measures for road safety.
3. To discuss measures for improving road safety education levels among the public.

Course Outcomes:

On completion of the course, learners will be able to…

CO1:Summarize the existing road transport scenario of our country

CO2:Explain the method of road accident investigation

CO3:Describe the regulatory provisions needed for road safety

CO4:Identify the safety issues for a road and make use of IRC's road safety manual for conducting road safety audit.

Course Contents (During 1hr Practical Session per week)

Unit I: Existing Road Transport Scenario **(02 Hours.)**

Introduction, national & international statistics related to road transport. Factors responsible for increase in vehicle growth. Share of public transport: importance and current scenario (national & international)

Suggestion for effective content delivery: Displaying updated and authentic statistics & real time scenario images during the session.

Unit II: Road Accidents & its Investigation **(03 Hours.)**

Savitribai Phule Pune University, Pune
TE (Civil Engineering) 2019 Pattern
(With effect from Academic Year 2021-22)

SEMESTER: V

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit					
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	TW	PR	OR	TUT	Total
301001	Hydrology and Water Resources Engineering	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301002	Water Supply Engineering	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301003	Design of Steel Structures	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301004	Engineering Economics and Financial Management	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301005	Elective I	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301006	Seminar	--	--	01	--	-	50	--	--	50	--	--	--	--	01	01
301007	Hydrology and Water Resources Engineering **Lab**	--	02	--	--	--	25	--	--	25	--	01	--	--	--	01
301008	Water Supply Engineering **Lab**	--	02	--	--	--	--	50	--	50	--	--	01	--	--	01
301009	Design of Steel Structures **Lab**	--	04	--	--	--	--	--	50	50	--	--	--	02	--	02
301010	Elective I **Lab**	--	02	--	--	--	25	--	--	25	--	01	--	--	--	01
301011	**Audit Course I:** Professional Ethics and Etiquettes/ Sustainable Energy Systems	--	--	01	--	GR	--	--	--	GR	--	--	--	--	--	--
	Total	**15**	**10**	**02**	**150**	**350**	**100**	**50**	**50**	**700**	**15**	**02**	**01**	**02**	**01**	**21**

Abhreviations: TH : Theory, TW: Term Work, PR : Practical, OR: Oral, TUT : Tutorial, GR: Grade

Elective I: 30I005

S N	Course Code	Course Name
01	301005 a	Advanced Fluid Mechanics and Hydraulic Machines
02	301005 b	Research Methodology and IPR
03	301005 c	Construction Management
04	301005 d	Advanced Concrete Technology
05	301005 e	Matrix Methods of Structural Analysis
06	301005 f	Advanced Mechanics of Structures

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SEMESTER-VI

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit					
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	TW	PR	OR	TUT	Total
301012	Waste Water Engineering	03	--	--	30	70	--	--	--	100	03	--	--		--	03
301013	Design of RC Struetures	03	--	--	30	70	--	--	--	100	03	--	--		--	03
301014	Remote Sensing and GIS	03	--	--	30	70	--	--	--	100	03	--	--		--	03
301015	Elective II	03	--	--	30	70	--	--	--	100	03	--	--		--	03
301016	Internship	--	--	--	--	--	100	--	--	100	--	04	--	--		04
301017	Waste Water Engineering Lab	--	02	--	--	--	--	--	50	50	--		--	01	--	01
301018	Design of RC Structures Lab	--	04	--	--	--	--	--	50	50	--		--	02	--	02
301019	Remote Sensing and GIS Lab	--	02	--	--	--	50	--	--	50	--	01	--	--	--	01
301020	Elective II Lab	--	02	--	--	--	50	--	--	50	--	01	--	--	--	01
301021	Audit Course II: Leadership and Personality Development/ Industrial Safety	--	--	01	--	GR	--	--	--	GR		--	--	--	--	--
	Total	**12**	**10**	**01**	**120**	**280**	**200**	**--**	**100**	**700**	**12**	**06**	**--**	**03**	**--**	**21**

Abbreviations: TH : Tbeory, TW: Term Work, PR : Practical, OR: Oral and TUT : Tutorial, GR: Grade

Elective II: 301015

S N	Course Code	Course Name
01	301015 a	Advanced Engineering Geology with Rock Mechanics
02	301015 b	Soft Computing Techniques
03	301015 c	Advanced Surveying
04	301015 d	Advanced Geotechnical Engineering
05	301015 e	Architecture and Town Planning
06	301015 f	Solid Waste Management

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TE (Civil Engineering) 2019 Pattern
(With effect from Academic Year 2021-22)

SEMESTER: V

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit					
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	TW	PR	OR	TUT	Total
301001	Hydrology and Water Resources Engineering	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301002	Water Supply Engineering	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301003	Design of Steel Structures	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301004	Engineering Economics and Financial Management	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301005	Elective I	03	--	--	30	70	--	--	--	100	03	--	--	--	--	03
301006	Seminar	--	--	01	--	-	50	--	--	50	--	--	--	--	01	01
301007	Hydrology and Water Resources Engineering **Lab**	--	02	--	--	--	25	--	--	25	--	01	--	--	--	01
301008	Water Supply Engineering **Lab**	--	02	--	--	--	--	50	--	50	--	--	01	--	--	01
301009	Design of Steel Structures **Lab**	--	04	--	--	--	--	--	50	50	--	--	--	02	--	02
301010	Elective I **Lab**	--	02	--	--	--	25	--	--	25	--	01	--	--	--	01
301011	Audit Course I: Professional Ethics and Etiquettes/ Sustainable Energy Systems	--	--	01	--	GR	--	--	--	GR	--	--	--	--	--	--
	Total	**15**	**10**	**02**	**150**	**350**	**100**	**50**	**50**	**700**	**15**	**02**	**01**	**02**	**01**	**21**

Abbreviations: TH : Theory, TW: Term Work, PR : Practical, OR: Oral, TUT : Tutorial, GR: Grade

Elective I: 301005

S N	Course Code	Course Name
01	301005 a	Advaneed Fluid Mechanics and Hydraulic Machines
02	301005 b	Research Methodology and IPR
03	301005 c	Construction Management
04	301005 d	Advanced Concrete Technology
05	301005 e	Matrix Methods of Structural Analysis
06	301005 f	Advanced Mechanies of Structures

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301011 b: Andit Course 1: Sustainahle Energy Systems

Teaehing scheme	Credit	Examiuation scheme
Tutorial: 01 Hours/week	--	Grade

Course objectives

01 To understand the impact of engineering solutions on a global, economic, environmentaland societal context.

02 To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

Course outcomes

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

01 To demonstrate an overview of the main sources of renewable energy.

02 To understand benefits of renewable and sustainable energy systems.

Course Contents

Unit I: Introdnction and Energy Fundamentals

Sustainable energy systems: issues for the 21st century, the critical challenges for a sustainable energy future, sustainable energy system: definitions, indicators, physics of energy: laws of thermodynamics energy forms and conversion, first and second laws and efficiencies devices: heat engines, refrigerators and heat pumps instantaneous and average power.

Unit 1I: Introduetion to Renewahle Energy

Wind energy, wind turbine technologies, wind resources and modeling, energy performance and environmental impacts, economics and economic development impacts, photovoltaic: PV and BIPV technologies, solar resources and modeling, energy performance and environmental impacts, economics and net metering.

Unit III: Biomass Eleetricity

Biomass technologies, introduction biomass productivity and modeling bio power: MSW, willows/switch grass/poplar, wood waste, bio-mass: transport fuels bio fuels, bio ethanol, biodiesel, algal, jatropha bio fuels and water land use impacts, food Vs fuel, renewable fuels standards.

Unit IV: Building Energy

Technologies and policy, smart buildings, lighting and LEDs, Heating/cooling, technologies

Reference books

01 Sustainable Energy Systems and Applications, İbrahim Dinçer, Calin Zamfireseu, Springer

02 Fundamentals of Renewable Energy Systems, D. Mukherjee, Atlantic

Savitribai Phuie Puue University, Pnne
S.E. (Electronics / E&TC Engineering) 2019 Course
(With effect from Academic Year 2020-21)

Semester-III

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	In-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
207005	Engineering Mathematics III	04	-	01	30	70	25	-	-	125	04	-	01	05
204181	Electronic Circuits	03	-	-	30	70	-	-	-	100	03	-	-	03
204182	Digital Circuits	03	-	-	30	70	-	-	-	100	03	-	-	03
204183	Electrical Circuits	03	-	-	30	70	-	-	-	100	03	-	-	03
204184	Data structures	03	-	-	30	70	-	-	-	100	03	-	-	03
204185	Electronic Circuit Lab	-	02	-	-	-	-	50	-	50	-	01	-	01
204186	Digital circuits Lab		02					50		50		01		01
204187	Electrical Circuit Lab	-	02	-	-	-	25	-	-	25	-	01	-	01
204188	Data Structures Lab	-	02	-	-	-	-	-	25	25	-	01	-	01
204189	Electronic Skill Development	-	02	-	-	-	25	-	-	25	-	01	-	01
204190	Mandatory Audit Course 3 &	-	-	-					-	-	-	-	-	-
Total		**16**	**10**	**01**	**150**	**350**	**75**	**100**	**25**	**700**	**16**	**05**	**01**	**22**

Shree Ramchandra College of Engineering * Pune

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Savitribai Phule Pune University, Pnne
S.E. (Electronics / E&TC Engineering) 2019 Course
(With effect from Academic Year 2020-21)

Semester-IV

Course Code	Course Name	Teachiug Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	In-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
204191	Signals & Systems	03	-	01	30	70	25	-	-	125	03	-	01	04
204192	Control Systems	03	-		30	70		-	-	100	03	-	-	03
204193	Principles of Communication Systems	03	-	-	30	70	-	-	-	100	03	-	-	03
204194	Object Oriented Programming	03	-	-	30	70	-	-	-	100	03	-	-	03
204195	Signals & Control System Lab		02				50			50		01		01
204196	Principle of Communication Systems Lab	-	02	-	-	-	-	50	-	50	-	01	-	01
204197	Object Oriented Programming Lab	-	02	-	-	-	-	-	50	50	-	01	-	01
204198	Data Analytics Lab		02				-		25	25		01		01
204199	Employability Skill Development	02	02	-	-	-	50	-	-	50	02	01	-	03
204200	Project Based Learning [1]	-	04				50		-	50		02		02
204201	Mandatory Audit Course 4[2]	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		**14**	**14**	**01**	**120**	**280**	**175**	**50**	**75**	**700**	**14**	**07**	**01**	**22**

Ahhreviations:
In-Sem: In semester — End-sem: End semester — TH : Theory — TW : Term Work
PR : Practical — OR : Oral — TUT : Tutorial

Note: Interested students of S.E. (Electronics/E&TC) can opt any one of the audit course from the list of audit courses prescribed by BoS (Eleetronlcs & Telecommuuications Engineering)

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Savitribai Phule University of Pune
Third Year Computer Eugineering (2015 Course)
(with effect from 2017-18)

Semester I

Course Code	Course	Teaching Scheme Hours / Week			Examination Scheme and Marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	TW	PR	OR	Total	TH/ TUT	PR
310241	Theory of Computation	03	--	--	30	70	--	--	--	100	03	--
310242	Database Management Systems (DBMS)	03	--	--	30	70	--	--	--	100	03	--
310243	Software Engineering & Project Management	03	--	--	30	70	--	--	--	100	03	--
310244	Information Systems & Engineering Economics	03	--	--	30	70	--	--	--	100	03	--
310245	Computer Networks (CN)	04	--	--	30	70	--	--	--	100	04	--
310246	Skills Development Lab	--	02	04	--	--	50	--	50	100	02	02
310247	DBMS Lab	--	--	04	--	--	25	50	--	75	--	02
310248	CN Lab	--	--	02	--	--	25	50	--	75	--	01
										Total Credit	18	05
	Total	16	02	10	150	350	100	100	50	750	23	
310249	Audit Course 3										Grade	

310249-Audit Course 3 (AC3) Options:

AC3-I: Cyber Security
AC3-II: Professional Ethics and Etiquettes
AC3-III: Emotional Intelligence
AC3-IV: MOOC- Learn New Skills
AC3-V: Foreign Language (Japanese- Module 3)

Abbreviations:

TW: Term Work **TH:** Theory **OR:** Oral **TUT:** Tutorial **PR:** Practical **Sem:** Semester

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Savitribai Phule Pune University

Second Year of Computer Engineering (2019 Course)

(With effect from Academic Year 2020-21)

Table of Contents

Savitribai Phule University of Pune
Third Year Computer Engineering (2015 Course)
(with effect from 2017-18)

Semester i1

Course Code	Course	Teaching Scheme Hours / Week			Examination Scheme and Marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	TW	PR	OR	Total	TH/ TUT	PR
310250	Design & Analysis of Algorithms	04	--	--	30	70	--	--	--	100	04	
310251	Systems Programming & Operating System (SP & OS)	04	--	--	30	70	--	--	--	100	04	--
310252	Embedded Systems & Internet of Things (ES & IoT)	04	--	--	30	70	--	--	--	100	04	--
310253	Software Modeling and Design	03	--	--	30	70	--	--	--	100	03	--
310254	Web Technology	03	--	--	30	70	--	--	--	100	03	--
310255	Seminar & Technical Communication	--	01	--	--	--	50	--	--	50	01	--
310256	Web Technology Lab	--	--	02	--	--	25	50	--	75	--	01
310257	SP & OS Lab	--	--	04	--	--	25	50	--	75	--	02
310258	ES & IoT Lab	--	--	02	--	--	50	--	--	50	--	01
									Total Credit		19	04
	Total	18	01	08	150	350	150	100	--	750	23	
310259	Audit Course 4										Grade	

310259-Audit Course 4(AC4) Options:

AC4-I: Digital and Social Media Marketing
AC4-II: Green Computing
AC4-III: Sustainable Energy Systems
AC4-IV: Leadership and Personality Development
AC4-V: Foreign Language (Japanese- Module 4)

Abbreviations:

TW: Term Work TH: Theory OR: Oral TUT: Tutorial PR: Practical Sem: Semester

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4

In addition to credits, it is recommended that there should be audit course in preferably in each semester from second year to supplement their knowledge and skills. Student will be awarded the bachelor degree if he/she earns 190 credits and clears all the audit courses specified in the syllabus. The student will be awarded grade as AP on successful completion of audit course. The student may opt for one of the audit courses per semester, starting in second year first semester. Though not mandatory, such a selection of the audit courses helps the learner to explore the subject of interest in greater detail resulting in achieving the very objective of audit course's inclusion. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course will be done at institute level itself. Method of conduction and method of assessment for audit courses are as suggested.

Criteria:

The student registered for audit course shall be awarded the grade AP (Audit Course Pass) and shall be included such AP grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA. Evaluation of audit course will be done at institute level itself. (Ref- http://www.unipune.ac.in/Syllabi_PDF/revised-2015/engineering/UG_RULE_REGULATIONS_FOR_CREDIT_SYSTEM-2015_18June.pdf)

Guidelines for Conduction and Assessment (Any one or more of following but not limited to)

- Lectures/ Guest Lectures
- Visits (Social/Field) and reports
- Demonstrations
- Surveys
- Mini Project
- Hands on experience on specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

- Written Test
- Demonstrations/ Practical Test
- Presentations
- IPR/Publication
- Report

Audit Course 3 Options

AC4- I	Digital and Social Media Marketing
AC4-II	Green Computing
AC4-III	Sustainable Energy Systems
AC4-IV	Leadership and Personality Development
AC4-V	Foreign Language (one of Japanese/ Spanish/French/German). Course contents for **Japanese (Module 4) are provided. For other languages institute may design suitably.**

Note: It is permitted to opt one of the audit courses listed at SPPU website too, if not opted earlier http://collegecirculars.unipune.ac.in/sites/documents/Syllabus%202017/Forms/AllItems.aspx

Savitribai Phule Pune University

Board of Studies - Automobile and Mechanical Engineering

Undergraduate Program - Automobile Engineering & Mechanical Engineering (2019 pattern)

Course Code	Course Name	Teaching Scheme (Hours/ Week)			Examination Scheme and Marks						Credit			
		TH	PR	TUT	ISE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
	Semester-III													
202041	Solid Mechanics	4	2	-	30	70	-	50	-	150	4	1	-	5
202042	Solid Modeling and Drafting	3	2	-	30	70	-	50	-	150	3	1	-	4
202043	Engineering Thermodynamics	3	2	-	30	70	-	-	25	125	3	1	-	4
202044	Engineering Materials and Metallurgy	3	2	-	30	70	25	-	-	125	3	1	-	4
203156	Electrical and Electronics Engineering	3	2	-	30	70	25	-	-	125	3	1	-	4
202045	Geometric Dimensioning and Tolerancing Lab	-	2	-	-	-	25	-	-	25	-	1	-	1
202046	Audit Course - III	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**16**	**12**	**-**	**150**	**350**	**75**	**100**	**25**	**700**	**16**	**6**	**-**	**22**
	Semester-IV													
207002	Engineering Mathematics - III	3	-	1	30	70	25	-	-	125	3	-	1	4
202047	Kinematics of Machinery	3	2	-	30	70	-	-	25	125	3	1	-	4
202048	Applied Thermodynamics	3	2	-	30	70	-	-	25	125	3	1	-	4
202049	Fluid Mechanics	3	2	-	30	70	-	-	25	125	3	1	-	4
202050	Manufacturing Processes	3	-	-	30	70	-	-	-	100	3	-	-	3
202051	Machine Shop	-	2	-	-	-	50	-	-	50	-	1	-	1
202052	Project Based Learning - II	-	4	-	-	-	50	-	-	50	-	2		2
202053	Audit Course - IV	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**15**	**12**	**1**	**150**	**350**	**125**	**-**	**75**	**700**	**15**	**6**	**1**	**22**

Abbreviations: TH: Theory, **PR**: Practical, **TUT**: Tutorial, **ISE**: In-Semester Exam, **ESE**: End-Semester Exam, **TW**: Term Work, OR: Oral

Note: Interested students of SE (Automobile Engineering and Mechanical Engineering) can opt for any one of the audit course from the list of audit courses prescribed by BoS (Automobile and Mechanical Engineering)

Instructions

- Practical/Tutorial must be conducted in three batches per division only.
- Minimum number of required Experiments/Assignments in PR/ Tutorial shall be carried out as mentioned in the syllabi of respective subjects.
- Assessment of tutorial work has to be carried out as a term-work examination. Term-work Examination at second year of engineering course shall be internal continuous assessment only.
- Project based learning (PBL) requires continuous mentoring by faculty throughout the semester for successful completion of the tasks selected by the students per batch. While assigning the teaching workload of 2 Hrs/week/batch needs to be considered for the faculty involved. The Batch needs to be divided into sub-groups of 5 to 6 students. Assignments / activities / models/ projects etc. under project based learning is carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester.
- Audit course is mandatory but non-credit course. Examination has to be conducted at the end of Semesters for award of grade at institute level. Grade awarded for audit course shall not be calculated for grade point & CGPA.

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202053 - Audit Course - IV

Teaching Seheme	Credits	Examination Scheme
-	-	-

GUIDELINES FOR CONDUCTION OF AUDIT COURSE

Faculty mentor sball be allotted for individual courses and he/she shall monitor the progress for successful accomplishment of the course. Such monitoring is uecessary for ensuring that the concept of self learning is being pursued by the students 'in true letter and spirit'.

- If any course through Swayam/ NPTEL/ virtual platform is selected the minimum duration shall be of 8 weeks.
- However if any of the course duration is less than the desired (8 weeks) the mentor shall ensure that other activities in form of assignments, quizzes, group discussion etc. (allied with the course) for the balance duration should be undertaken.

In addition to credits courses, it is mandatory that there should be an audit course (non-credit course) from second year of Engineering. The student will be awarded grade as AP on successful completion of the audit course. The student may opt for any one of the audit courses in each semester. Such audit courses can help the student to get awareness of different issues which make an impact on human lives and enhance their skill sets to improve their employability. List of audit courses offered in the semester is provided in the curriculum. Students can choose one of the audit courses from the list of courses mentioned. Evaluation of the audit course will be done at institute level.

The student registered for audit course shall be awarded the grade AP and shall be included such grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not considered in the calculation of the performance indices SGPA and CGPA. Evaluation of the audit course will be done at institute level itself.

Selecting an Audit Course

List of Courses to be opted (Any one) under Audit Course IV

- Language & Mind Emotional Intelligence
- Advanced Foreign Language (preferably German/ Japanese)
- Human Behaviour
- Speaking Effectively
- Business Ethics
- Technical writing/ Research writing

The titles indicated above are subject to change in time to come and such an alteration (if any) should be brought to the notice of the BoS.

Using NPTEL Platform: (preferable)

NPTEL is an initiative by MHRD to enhance learning effectiveness in the field of technical education by developing curriculum based video courses and web based e-courses. The details of NPTEL courses are available on its official website www.nptel.ac.in

- Students can select any one of the courses mentioned above and has to register for the corresponding online course available on the NPTEL platform as an Audit course.
- Once the course is completed the student can appear for the examination as per the guidelines on the NPTEL portal.
- After clearing the examination successfully; student will be awarded with a certificate.

Assessment of an Audit Course

- The assessment of the course will be done at the institute level. The institute has to maintain the record of the various audit courses opted by the students. The audit course opted by the students could be interdisciplinary.
- During the course students will be submitting the online assignments. A copy of the same can be submitted as a part of term work for the corresponding Audit course.
- On the satisfactory submission of assignments, the institute can mark as "Present" and the student will be awarded the grade AP on the mark sheet.

Savitribai Phule Pune University

Board of Studies - Automobile and Mechanical Engineering

Undergraduate Program - Automobile Engineering & Mechanical Engineering (2019 pattern)

Course Code	Course Name	Teaching Scheme (Hours/ Week)			Examination Seheme and Marks						Credit			
		TH	PR	TUT	ISE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
	Semester-III													
202041	Solid Mechanics	4	2	-	30	70	-	50	-	150	4	1	-	5
202042	Solid Modeling and Drafting	3	2	-	30	70	-	50	-	150	3	1	-	4
202043	Engineering Thermodynamics	3	2	-	30	70	-	-	25	125	3	1	-	4
202044	Engineering Materials and Metallurgy	3	2	-	30	70	25	-	-	125	3	1	-	4
203156	Electrical and Electronics Engineering	3	2	-	30	70	25	-	-	125	3	1	-	4
202045	Geometric Dimensioning and Tolerancing Lab	-	2	-	-	-	25	-	-	25	-	1	-	1
202046	Audit Course - III	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**16**	**12**	**-**	**t50**	**350**	**75**	**100**	**25**	**700**	**16**	**6**	**-**	**22**
	Semester-1V													
207002	Engineering Mathematics - III	3	-	1	30	70	25	-	-	125	3	-	1	4
202047	Kinematics of Machinery	3	2	-	30	70	-	-	25	125	3	1	-	4
202048	Applied Thermodynamics	3	2	-	30	70	-	-	25	125	3	1	-	4
202049	Fluid Mechanics	3	2	-	30	70	-	-	25	125	3	1	-	4
202050	Manufacturing Processes	3	-	-	30	70	-	-	-	100	3	-	-	3
202051	Machine Shop	-	2	-	-	-	50	-	-	50	-	1	-	1
202052	Project Based Learning - II	-	4	-	-	-	50	-	-	50	-	2		2
202053	Audit Course - IV	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**15**	**12**	**1**	**150**	**350**	**125**	**-**	**75**	**700**	**15**	**6**	**1**	**22**

Abbreviations: TH: Theory, **PR**: Practical, **TUT**: Tutorial, **ISE**: In-Semester Exam, **ESE**: End-Semester Exam,**TW**: Term Work, OR: Oral

Note: Interested students of SE (Automobile Engineering and Mechanical Engineering) can opt for any one of the audit course from the list of audit courses prescribed by BoS (Automobile and Mechanical Engineering)

Instructions

- Practical/Tutorial must be conducted in three batches per division only.
- Minimum number of required Experiments/Assignments in PR/ Tutorial shall be carried out as mentioned in the syllabi of respective subjects.
- Assessment of tutorial work has to be carried out as a term-work examination. Term-work Examination at second year of engineering course shall be internal continuous assessment only.
- Project based learning (PBL) requires continuous mentoring by faculty throughout the semester for successful completion of the tasks selected by the students per batch. While assigning the teaching workload of 2 Hrs/week/batch needs to be considered for the faculty involved. The Batch needs to be divided into sub-groups of 5 to 6 students. Assignments / activities / models/ projects etc. under project based learning is carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester.
- Audit course is mandatory but non-credit course. Examination has to be conducted at the end of Semesters for award of grade at institute level. Grade awarded for audit course shall not be calculated for grade point & CGPA.

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202046 - Audit Course - III		
Teaching Scheme	Credits	Examination Scheme
-	-	-

GUIDELINES FOR CONDUCTION OF AUDIT COURSE

Faculty mentor shall be allotted for individual courses and he/she shall monitor the progress for successful accomplishment of the course. Sucb monitoring is necessary for ensuring that the concept of self learning is being pursued by the students 'in true letter and spirit'.

- If any course through Swayam/ NPTEL/ virtual platform is selected the minimum duration shall be of 8 weeks.
- However if any of the course duration is less than the desired (8 weeks) the mentor shall ensure that other activities in form of assignments, quizzes, group discussion etc. (allied with the course) for the balance duration should be undertaken.

In addition to credits courses, it is mandatory that there should be an audit course (non-credit course) from second year of Engineering. The student will be awarded grade as AP on successful completion of the audit course. The student may opt for any one of the audit courses in each semester. Such audit courses can help the student to get awareness of different issues which make an impact on human lives and enhance their skill sets to improve their employability. List of audit courses offered in the semester is provided in the curriculum. Students can choose one of the audit courses from the list of courses mentioned. Evaluation of the audit course will be done at institute level.

The student registered for audit course shall be awarded the grade AP and shall be included such grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not considered in the calculation of the performance indices SGPA and CGPA. Evaluation of the audit course will be done at institute level itself.

Selecting an Audit Course

List of Courses to be opted (Any one) under Audit Course III

- Technical English For Engineers
- Entrepreneurship Development
- Developing soft skills and personality
- Design Thinking
- Foreign Language (preferably German/ Japanese)
- Science, Technology and Society

The titles indicated above are subject to change in time to come and such an alteration (if any) should be brought to the notice of the BoS.

Using NPTEL Platform: (preferable)

NPTEL is an initiative by MHRD to enhance learning effectiveness in the field of technical education by developing curriculum based video courses and web based e-courses. The details of NPTEL courses are available on its official website www.nptel.ac.in

- Students can select any one of the courses mentioned above and has to register for the corresponding online course available on the NPTEL platform as an Audit course.
- Once the course is completed the student can appear for the examination as per the guidelines on the NPTEL portal.
- After clearing the examination successfully; student will be awarded with a certificate.

Assessment of an Audit Course

- The assessment of the course will be done at the institute level. The institute has to maintain the record of the various audit courses opted by the students. The audit course opted by the students could be interdisciplinary.
- During the course students will be submitting the online assignments. A copy of the same can be submitted as a part of term work for the corresponding Audit course.
- On the satisfactory submission of assignments, the institute can mark as "Present" and the student will be awarded the grade AP on the marksheet.