PPSU

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

B. TECH. CIVIL
(SUSTAINABLE) ENGINEERING

SYLLABUS BOOK

AY 2025-26

INSTITUTE VISION
To emerge as an Institute of Excellence by imparting value-based education aided with Research, Innovation and Entrepreneurial skills.

INSTITUTE MISSION	
1.	To impart the holistic engineering education of highest quality & prepare socially responsible professionals with entrepreneurial skills.
2.	To prepare value-aided engineering professionals to meet up global industry requirements by imparting cutting edge professional education.
3.	To inculcate the attitude of research and innovation among the stake holders through experiential and project-based teaching-learning pedagogy.
4.	To acquire global talent pool by providing world class amenities for teaching, learning & research.

Graduates will demonstrate ability to:

PEO No	PROGRAMME EUCATIONAL OBJECTIVES
PEO 1	Solve real-world engineering problems, design and develop innovative and cost-effective solutions exhibiting engineering skills/fundamentals to cater needs of society.
PEO 2	Excel in Industry/technical profession, higher studies, and entrepreneurship exhibiting comprehensive competitiveness.
PEO 3	Exhibit professional ethics & values, effective communication, teamwork, multidisciplinary approach, and ability to relate engineering issues to broader societal framework.

PO No	PROGRAMME OUTCOMES
PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first-principles of mathematics, natural sciences and engineering sciences..
PO 3	Design/Development of Solutions: Design solutions for complex engineering problems and design system-components or processes that meet specified needs with appropriate consideration for public health & safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data, and synthesis of information to provide valid conclusions for complex problems.
PO 5	Engineering Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering & IT tools including prediction and modelling to engineering activities, with an understanding of their limitations.
PO 6	The Engineer and The World: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice; understand the impact of engineering solutions in societal and environmental contexts, and demonstrate knowledge of, and need for, sustainable development.
PO 7	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 8	Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 9	Communication: Communicate effectively on engineering activities with the engineering community and with society at large—such as being able to write reports, design documentation, make effective presentations and give/receive instructions.
PO 10	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's work, as a member or leader in a team in a multidisciplinary environment to manage projects.
PO 11	Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in thse broadest context of technological change.

PSO No	PROGRAMME SPECIFIC OUTCOMES (PSO) CIVIL (SUSTAINABLE ENGINEERING)
PSO 1	Apply civil engineering principles to design and execute infrastructure projects that incorporate sustainable practices, including efficient use of materials, energy conservation, and environmentally friendly construction techniques.
PSO 2	Demonstrate the ability to assess, manage, and minimize environmental impacts of civil engineering projects through proper waste management, water conservation, pollution control, and use of sustainable materials.
PSO 3	Utilize modern engineering tools, software, and technologies to plan, analyze, and implement sustainable civil engineering solutions such as green buildings, renewable energy integration, and eco-friendly infrastructure.

Credit Guidelines (General)			
Component	**Hour/Week**	**Credit**	**Total Hours/Semester**
Theory	1	1	15
Practical	2	1	30
Tutorial	1	1	15
Note: In specific cases; extra credits can be granted for specific/important subjects.			

CO-PO Mapping Guidelines		
Mapping Level	**% age Mapping**	**Indicator**
0 / -	0	No Mapping
1	0-33	Low Level (Slightly Mapped)
2	33-66	Medium Level (Moderately Mapped)
3	>66	High Level (Strongly Mapped)

Syllabus Book

B. Tech.

Civil (Sustainable Engineering)

P P Savani University

School of Engineering

Effective From: 2025-26

Authored by: P P Savani University

CONTENT

FIRST YEAR B. TECH.

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

TEACHING & EXAMINATION SCHEME FOR FIRST YEAR B.TECH. CIVIL (SUSTAINABLE) ENGINEERING PROGRAMME AY: 2025-26

Sem	Course Code	Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
1 OR 2	SESH1110	Calculus	SH	3	0	2	5	5	40	60	0	0	100	0	200
	SEME1210	Basics of Mechanical Engineering	ME	3	0	2	5	5	40	60	0	0	40	60	200
	SEIT1210	Python for Engineers	CE	3	2	0	5	4	40	60	40	60	0	0	200
	SESH1130	Experimental Physics	SH	3	2	0	5	4	40	60	40	60	0	0	200
	CFLS2130	Intermediate Communicative English	CFLS	3	0	0	3	3	40	60	0	0	0	0	100
	SESH1120	Linear Algebra	SH	3	0	2	5	5	40	60	0	0	100	0	200
	SECV1210	Basics of Civil Engineering	CV	3	0	2	5	5	40	60	0	0	40	60	200
	SECE1210	Programming with C Essentials	CE	3	2	0	5	4	40	60	40	60	0	0	200
	SEEC1210	Basics of Electrical and Electronics	EC	3	2	0	5	4	40	60	40	60	0	0	200
	SEME1220	Engineering Workshop	ME	0	2	0	2	2	0	0	100	0	0	0	100
	SECE1220	Digital Proficiency	CE	3	0	0	3	3	40	60	0	0	0	0	100
						Total	**48**	**44**							**1900**

Group 1	SESH1110	Calculus	SH	3	0	2	5	5	40	60	0	0	100	0	200
	SEME1210	Basics of Mechanical Engineering	ME	3	0	2	5	5	40	60	0	0	40	60	200
	SEIT1210	Python for Engineers	CE	3	2	0	5	4	40	60	40	60	0	0	200
	SESH1130	Experimental Physics	SH	3	2	0	5	4	40	60	40	60	0	0	200
	CFLS2130	Intermediate Communicative English	CFLS	3	0	0	3	3	40	60	0	0	0	0	100
						Total	**23**	**21**							**900**
Group 2	SESH1120	Linear Algebra	SH	3	0	2	5	5	40	60	0	0	100	0	200
	SECV1210	Basics of Civil Engineering	CV	3	0	2	5	5	40	60	0	0	40	60	200
	SECE1210	Programming with C Essentials	CE	3	2	0	5	4	40	60	40	60	0	0	200
	SEEC1210	Basics of Electrical and Electronics	EC	3	2	0	5	4	40	60	40	60	0	0	200
	SEME1220	Engineering Workshop	ME	0	2	0	2	2	0	0	100	0	0	0	100
	SECE1220	Digital Proficiency	CE	3	0	0	3	3	40	60	0	0	0	0	100
						Total	**25**	**23**							**1000**

P P Savani University
School of Engineering

Department of Science and Humanities

Course Code: SESH1110
Course Name: Calculus
Prerequisite Course/s: Algebra, Geometry, Trigonometry & Pre-Calculus till 12th Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

To help learners to

- summarize concept of calculus to enhance ability of analysing mathematical problems.
- acquire knowledge and ability to work with differentiation and integration for applications of mathematical techniques in engineering.
- develop the tool of convergence or divergence of any infinite series and power series for learning advanced Engineering Mathematics.
- acquire knowledge of partial differentiation and ability to work with applications to advanced Engineering Mathematics.
- application of concavity of graph and find out points of inflection.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Calculus** Limits, Continuity, Types of Discontinuity, Successive Differentiation, Rolle's Theorem, LMVT, CMVT, Maxima and Minima.	09	20
2.	**Sequence and Series-I** Convergence and Divergence, Comparison Test, Integral Test, Ratio Test, Root Test, Alternating Series, Absolute and Conditional Convergence.	09	20
3.	**Sequence and Series-II** Power series, Taylor and Maclaurin series, Indeterminate forms and L'Hospital's Rule.	05	10
4.	**Partial Derivatives** Function of several variables, Partial differentiation, Applications, Chain rule, Linear approximations, Maxima and Minima, Euler's theorem, Lagrange multiplier.	11	30
5.	**Curve tracing** Tracing of Cartesian Curves, Polar Coordinates, Polar and Parametric Form of Standard Curves, Areas and Length in Polar co-ordinates	11	20
	TOTAL	45	100

List of Tutorials:

Sr. No.	Name of Tutorial	Hours
1.	Calculus-1	04
2.	Calculus-2	04
3.	Calculus-3	02
4.	Sequence and Series-1	04
5.	Sequence and Series-2	02
6.	Sequence and Series-3	02
7.	Partial Derivatives-1	04
8.	Partial Derivatives-2	02
9.	Curve tracing-1	04
10.	Curve tracing-2	02
	TOTAL	30

Text Book:

Title	Author(s)	Publication
Thomas' Calculus	George B. Thomas, Maurice D. Weir and Joel Hass	Pearson
Elementary linear Algebra	Howard Anton and Chrish Rorres	Wiley

Reference Book:

Title	Author(s)	Publication
Advanced Engineering Mathematics	E Kreyszig	John Wiley and Sons
A textbook of Engineering Mathematics	N P Bali and Manish Goyal	Laxmi
Higher Engineering Mathematics	B S Grewal	Khanna
Engineering Mathematics	T Veerarajan	Tata Mc Graw Hill
Engineering Mathematics-1 (Calculus)	H. K. Dass and Dr. Rama Verma	S. Chand

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average ofthe same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 50 marks
- Continuous Evaluation consists of self-performance assignment to 20 marks.
- Internal Viva consists of 30 marks.

Course Outcome(s):

After the completion of the course, the student will be able to

SESH1110	CALCULUS

CO 1	Recall the concepts of limit, continuity and differentiability for analysing mathematical problems.
CO 2	Analyze the series for its convergence and divergence to solve real world problems.
CO 3	Evaluate various limit problems using L' Hospital's rule.
CO 4	Identify the ordinary differentials and partial differentials and solve the maximum and minimum value of function.
CO 5	Construct the graphs for function with intervals and identify more application for function.

Mapping of CO with PO

SESH1110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	3	1	1							1
CO 2	3	2	1								1
CO 3	2	2	1								
CO 4	2	2	1	1							1
CO 5	2	2	1								1

Mapping of CO with PSO

SESH1110	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	2		2
CO 3	3	2	3
CO 4	2	3	2
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Calculus	1, 2, 3, 4, 5
2	Sequence and Series – I	1, 2, 3, 4, 6
3	Sequence and Series – II	1, 2, 3, 4, 6
4	Partial Derivatives	1, 2, 3, 4, 5
5	Curve tracing	1, 2, 3, 4, 5, 6

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1210
Course Name: Basics of Mechanical Engineering
Prerequisite Course(s): -- None

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- study the fundamentals of mechanical systems.
- study and appreciate significance of mechanical engineering in different fields of engineering.
- carry out simple land survey and recent trends in civil engineering.
- understand components of building, building terminology and construction materials.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Boiler:** Introduction, Fundamental Principles, Classification	07	15
2.	**Classification of Engineering Materials:** Classification of engineering material, composition of cast iron, mechanical properties and uses; Alloy steel and their applications; Stress-Strain diagram, Hooks law and modulus of elasticity. Tensile, shear and hardness.	10	20
3.	**Fluids:** Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Bernoulli's equation for incompressible fluids, viscous and turbulent flow and Metacentric height.	04	08
4.	**Measurement:** Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainty analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set.	06	12
6.	**Basic Concepts of Thermodynamics:** Prime Movers - Meaning and Classification; the Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific Heat Capacity, Internal Energy, SpecificVolume; Thermodynamic Systems, All Laws of Thermodynamics	04	09

7.	**Basics of I.C Engines:** Construction and Working of 2 Stroke & 4 Stroke Petrol and Diesel Engines, Difference Between 2-Stroke - 4 Stroke Engine & Petrol-Diesel Engine, Efficiency of I. C. Engines	08	18
8.	**Power Transmission Elements:** Construction and Applications of Couplings, Clutches and Brakes, Difference Between Clutch and Coupling, Types ofBelt Drive and Gear Drive	06	18
	TOTAL	45	100

List of Tutorials:

Sr. No.	Name of Tutorials	Hours
1.	To understand construction and working of various types of boilers	04
2.	To understand construction and working of mountings	04
3.	To understand construction and working of accessories	04
4.	To understand construction and working 2 –stroke & 4 –stroke Petrol Engines	04
5.	To understand construction and working 2 –stroke & 4 –stroke Diesel Engines	04
6.	To understand the types of hardness test	04
7.	To understand the stress-strain curve for ductile and brittle material	04
8.	To understand the basic concept of metacentric height	02
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Elements of Mechanical Engineering	S. B. Mathur, S. Domkundwar	Dhanpat Rai & Sons Publications
Material Science	Narula	TMH
Basic Mechanical Engineering	Agrawal B & CM	TMH
Instrumentation and Measurement	Nakra and Chaudhary	TMH
Combustion Engines	Ganesan	TMH.

Reference Book(s):

Title	Author(s)	Publication
Thermal Engineering	R. K. Rajput	Laxmi Publications
Basic Mechanical Engineering	T.S. Rajan	Wiley Eastern Ltd., 1996.

Web Material Link(s):

- http://nptel.ac.in/course.php
- http://nptel.ac.in/courses/105107157/
- http://nptel.ac.in/courses/105101087/
- http://nptel.ac.in/courses/105107121/
- http://nptel.ac.in/courses/105104100/

Course Evaluation:

Theory:

- Continuous evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.

- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Tutorial

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 40 marks.
- External Practical viva consists of 60 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEME1210	BASICS OF MECHANICAL ENGINEERING
CO 1	Understand the concept of Boiler, Material types and its application.
CO 2	Understand the Fluid properties and measurement process.
CO 3	Understand the concept of basic thermodynamics
CO 4	Comprehend the importance of mechanical engineering equipments like IC engine and power transmission elements.
CO 5	Analyze mechanical properties of materials and apply concepts of stress–strain relationships and elasticity in engineering problems.

Mapping of CO with PO

SEME1210	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	3	1	3	2	2					2
CO 2	2	3	1	3	2	2					2
CO 3	1	3	1	3	2	2					2
CO 4	1	3	1	3	2	2					2
CO 5	1	3	1	1	2	2					2

Mapping of CO with PSO

SEME1210	PSO1	PSO2	PSO3
CO 1	2	3	2
CO 2		3	3
CO 3	3	2	2
CO 4	3	3	3
CO 5	2	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Boiler	1, 2, 3
2	Classification of Engineering Materials	1, 2
3	Fluids	1, 2
4	Measurement	1, 2
5	Basics Concept of Thermodynamics	1, 2, 3
6	Basics of I.C. Engines	1, 2
7	Power Transmission Elements	1, 2

P P Savani University
School of Engineering
Department of Information & Technology Engineering

Course Code: SEIT1210
Course Name: Python for Engineers
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand the basic object-oriented programming.
- identify an appropriate approach to solve computational problems.
- develop logic building and problem-solving skills.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Python** History, Features of Python, Applications of Python, Working with Python, Input and Output Functions in Python, Variable, Assignment, Types, Basic Operators, Expressions and Types of Data Int, Float, Complex, String, List, Tuple, Set, Dictionary and its Methods, Type Conversions, Comments, Input Processing and output.	04	07
2.	**Decision Structures in Python** Conditional Blocks Using if, Else and Else If, Simple for Loops in Python, For Loop Using Ranges, String, List and Dictionaries Use of While Loops in Python, Loop Manipulation Using Pass, Continue, Break and Else	04	07
3.	**Array and Strings in Python** Arrays, Basic Strings, Accessing Strings, Basic Operations, String Slicing, Testing, Searching and Manipulating Strings, Function and Methods.	03	08
4.	**Dictionary, List, Tuples and Sets** Dictionaries, Accessing Values in Dictionaries, Working with Dictionaries, Properties, Functions and Methods. Sets, Accessing Values in Set, Working with Set Properties, Functions and Methods, Tuple, Accessing Tuples, Operations, Working, Functions and Methods. List, Accessing List, Operations, Working With Lists, Function and methods, two-dimensional lists.	05	10
5.	**Functions, Modules and Packages in Python** Introduction to Functions, defining a Function, Calling a Function, Types of Functions, Function Arguments, Anonymous Functions, Global and Local Variables, Importing Module, Math Module, Random Module, Introduction to Packages: Numpy, Pandas, Matplotlib.	07	14
Section II			
Module No.	Content	Hours	Weightage in %
6.	**Python Object Oriented Programming**	08	16

	OOP Concept of Class, Object and Instances, Constructor, Class, Attributes, Methods, Using Properties to Control Attribute Access, and Destructors, Inheritance, Overloading Operators. Objects in Python: Creating Python Classes, Modules and Packages, Inheritance in Python, Polymorphism in Python.		
7.	**Files & Regular Expression in Python** Introduction to File Input and Output, Writing Data to a File, Reading Data from a File, Additional File Methods, Using Loops to Process Files, Processing Records, RE Module, Basic Patterns, Regular Expression Syntax, Regular Expression Object, Search Object, Findall method, Split method, Sub Method.	05	15
8.	**Exception Handling in Python** Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Throwing Mechanism, Catching Mechanism	05	09
9.	**Building Desktop Application** Exploring the Tkinter Library in Python, Creating basic Desktop application using Tkinter	04	14
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Introduction to Python (Introduction to IDLE, different data types, Input Output in Python, Operators, Operator precedence).	04
2.	Manipulation of Strings.	04
3.	Implementation of Dictionaries, Sets in Python.	03
4.	Implementation of Tuples and Lists in Python.	03
5.	Working with decision structures in Python	04
6.	Working with functions and modules in Python	02
7.	Working with Object-oriented paradigms in Python	04
8.	Implementation of file handling in Python.	02
9.	Exception handling in Python	02
10.	Building desktop application of your own calculator in Python.	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Python approach Programming: A modular	Sheetal Taneja, Naveen Kumar	Pearson

Reference Book(s):

Title	Author(s)	Publication
Think Python: How to Think Like a Computer Scientist	Allen Downey	Green Tea Press
Python Cookbook	David Ascher, Alex Martelli Oreilly	O Reilly Media

Web Material Link(s):

- https://www.tutorialspoint.com/python/
- https://www.w3schools.com/python/
- https://onlinecourses.nptel.ac.in/noc20_cs83/preview

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of practical performance which should be evaluated out of 10 for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva-voce consists of 30 marks during End Semester Exam.

Course Outcome(s):

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

SEIT1210	**PYTHON FOR ENGINEERS**
CO 1	Interpret the fundamental python syntax, semantics and fluent in the use of python control flow statements.
CO 2	Determine the methods to create and manipulate python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
CO 3	Articulate the object-oriented programming concepts such as encapsulation, inheritance and polymorphism as used in python.
CO 4	Identify the commonly used operations involving file systems and regular expressions.
CO 5	Design object-oriented and GUI-based Python applications.

Mapping of CO with PO

SEIT1210	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	2	2			2				1		1
CO 2	3	3	1		3				1		2
CO 3	2	3	2		2				1		2
CO 4	2	2	1	1	3				1		2
CO 5	2	2	3	1	3	1		1	2	1	2

Mapping of CO with PSO

SEIT1210	PSO1	PSO2	PSO3
CO 1	2	3	3
CO 2		2	
CO 3	3	2	2
CO 4	2	3	3
CO 5	2	3	

Level of Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1.	Introduction to Python	1,2,4
2.	Decision Structures in Python	1,2,3
3.	Array and Strings in Python	1,2,3
4.	Dictionary, List, Tuples and Sets	2,3,4

5.	Functions, Modules and Packages in Python	2,3,4
6.	Python Object Oriented Programming	3,4,6
7.	Files & Regular Expression in Python	3,4.6
8.	Exception Handling in Python	3,4,5
9.	Building Desktop Application	2,3,4

P P Savani University
School of Engineering

Department of Science and Humanities

Course Code: SESH1130
Course Name: Experimental Physics
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Prepare students for career in engineering where physics principles can be applied for the advancement of technology.
- Think in core concept of engineering application by studying various topics involved in branch specific application.

Course Content:

Module No.	Content	Hours	Weightage in %
1	**QUANTUM PHYSICS** (Prerequisites: Dual nature of radiation, Photoelectric effect Matter waves, wave nature of particles, de-Broglie relation, Davisson-Germer experiment). Introduction; De Broglie hypothesis of matter waves; Properties of matter waves; Wave function; Physical interpretation of wave function; Phase velocity and group velocity and their relation; Heisenberg uncertainty principle; non-existence of electron in nucleus; Schrodinger's time dependent wave equation; time independent wave equation; Quantum Computing (overview).	07	16
2	**Acoustic and Ultrasonic** (Prerequisites: Sound, propagation of sound, concept of frequency and wave length). Acoustic – Introduction, Classification and Characterization of Sound, Sabine's formula for reverberation (without derivation), Absorption Coefficients, Sound Absorbing Materials, factors affecting the acoustics of buildings and remedies, Sound Insulation. Ultrasonic – Introduction, Properties of Ultrasonic, Generation of Ultrasonic sound: Piezoelectric & Magnetostriction effect, Applications of Ultrasonic.	07	16
3	**LASER AND FIBRE OPTICS** (Prerequisites: Absorption, recombination, Valance and conduction bands, refractive index of a material, Snell's law) LASER – Introduction, Characteristics, Absorption, Spontaneous and stimulated emission; metastable state, population inversion, Pumping mechanism, components of LASER; Nd:YAG Laser, Applications of LASER, Interference, Diffraction, Diffraction grating.	09	18

	FIBRE OPTICS – Introduction, Optical Fiber construction, working principle and types, Numerical Aperture, Acceptance angle and Attenuation, Fiber optic communication system, Applications of Optical Fiber.		
4	**NANOSCIENCE AND NANOTECHNOLOGY** (Prerequisites: Nano scale and structures, general purpose of nano technology, method of formation of nano structure, fullerenes, carbon nanotubes). Nanomaterials : Properties (Physical, Mechanical, Optical, Electrical, Magnetic); Surface to Volume Ratio; Synthesis of Nanomaterials: Bottom up and Top down technique; Methods to synthesize nanomaterials: PVD & Sol-gel, Applications.	06	14
5	**SUPERCONDUCTORS** (Prerequisites: Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical resistivity and conductivity temperature dependence of resistance). Superconductors: Introduction, Critical temperature, Properties of superconductors, Type of superconductors: Type I and Type II and high Tc superconductors, Applications: Magnets, Josephson effect, SQUID, Maglev, other.	07	18
6	**SEMICONDUCTORS** (Prerequisites: Intrinsic and extrinsic semiconductors, Energy bands in conductors, semiconductors and insulators, Semiconductor diode, I-V characteristics in forward and reverse bias) Direct & indirect band gap semiconductor; Classification of Conductors, Semiconductors and Insulators on the basis of energy band, Intrinsic & Extrinsic Semiconductors, Diodes, p-n junction (unbiased, forward bias, reverse bias); Applications of semiconductors: LED, Zener diode, Photovoltaic cell, Advantages of Semiconductror Devices, Transistors (working and characteristics)	09	18
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1.	To understand some basic aspects of the graph drawing.	04
2.	To understand some basic aspects of error analysis.	02
3.	To study the series and parallel connections of resistors.	02
4.	To study the series and parallel connections of capacitors.	04
5.	To study the energy band gap of semiconductor materials of a P-N junction of diode.	02
6.	To study the I-V characteristic of LED and dynamic resistance of a given LED.	02
7.	To study the I-V characteristic of ZENER diode and measurement of dynamic resistance.	02
8.	To determine the Numerical Aperture and acceptance angle of an optical fiber	04
9.	To determine wavelength of laser using diffraction grating.	04
10.	To determine the velocity of ultrasonic waves in a given liquid and also to determine the compressibility of the liquid.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Concept of the Modern Physics	A. Beiser	Tata McGraw-Hill Education
Basic electrical engineering	Kothari and Nagrath	Tata McGraw-Hill Education
Quantum Mechanics	P.M. Mathew, K. Venkatesan	Tata McGraw-Hill Education
Waves and Acoustics	Pradipkumar Chakrabarti Satyabrata Chawdhary	New Central Book Agency
Lasers and Nonlinear Optics	G.D. Baruah	Pragati Prakashan
Engineering Physics	G Vijayakumari	Vikas Publishing house PVT LTD
Basic Electronics for Scientists and Engineers	Dennis L. Eggleston	Cambridge University Press

Web Material Link(s):

- http:/nptel.ac.in/course.php

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of Performance and regular manual writing, checking of the practical throughout the semester.
- Internal viva or practical performance consist of 20 Marks.
- Practical performance/test of 30 marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SESH1130	EXPERIMENTAL PHYSICS
CO 1	Understand the framework of quantum mechanics and apply the knowledge of basic quantum mechanics to construct one dimensional Schrodinger's wave equation.
CO 2	Classify the phenomenon of acoustics and ultrasonic in various engineering field and apply it for various engineering and medical fields.
CO 3	Describe the laser and articulate the idea of optical fiber communications and apply the concepts of lasers and optical fiber communications in every possible sector.
CO 4	Interpret the concept of Nanotechnology and understand the synthesis and applications of Nanomaterials from technological prospect. Discover the types and properties of Superconductors. Relate the behavior of superconductors at high temperatures
CO 5	Distinguish pure, impure semiconductors and characteristics of semiconductor devices. Thus, will be able to use basic concepts to analyze and design a wide range of semiconductor devices.

Mapping of CO with PO

SESH1130	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	1	2	1					1	2
CO 2	2	3	2	3	2	1	1		1	1	2
CO 3	2	2	2	2	2		1		1	2	2

CO 4	3	2	2	2	1	1	2	1	1	1	3
CO 5	2	2	3	2	2	1	1		1	1	2

Mapping of CO with PSO

SESH1130	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	2	2
CO 3	2	3	3
CO 4	2		2
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Quantum Physics	2
2	Acoustic and Ultrasonic	3
3	Laser and Fibre Optics	2,3
4	Nanoscience and Nanotechnology	2,3,6
5	Superconductors and Supercapacitors	1, 2,3
6	Semiconductor Physics and Technology	1,6

P P Savani University
School of Engineering
Department of Science & Humanities

Course Code: SESH1120
Course Name: Linear Algebra
Prerequisite Course/s: -- Algebra, Geometry, Trigonometry &Pre-Calculus till 12th Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- Analyses and solve system of linear equations and understand characteristics of Matrices.
- Learn about and work with vector space, linear transformation and inner product space.
- Apply concepts of linear algebra for solving science and engineering problems.
- Introduce the concept of improper integral and Beta-Gamma Function.

Course Content:

Module No.	Content	Hours	Weightage in %
1	**Matrix Algebra** Elementary Row and Column operations, Inverse of matrix, Rank of matrix, System of Linear Equations, Characteristic Equation, Eigen values and Eigen vector, Diagonalization, Cayley Hamilton Theorem.	12	30
2	**Vector Space** Concept of vector space, Subspace, Linear Combination, Linear Dependence and Independence, Span, Basis and Dimension, Row Space, Column Space and Null Space, Rank and Nullity.	11	20
3	**Linear Transformation** Introduction of Linear Transformation, Kernal and Range, Rank and Nullity, Inverse of Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps.	09	20
4	**Inner Product Space** Inner Product, Angle and Orthogonality, Orthogonal projection, Gram-Schmidt process and QR Decomposition, least square decomposition.	08	20
5	**Beta and Gamma function** Improper Integrals, Convergence, Properties of Beta and Gamma Function, Duplication Formula (without proof)	05	10
	TOTAL	45	100

List of Tutorial:

Sr. No.	Name of Tutorial	Hours
1.	Matrix Algebra-1	04

2.	Matrix Algebra-2	02
3.	Vector Space-1	04
4.	Vector Space-2	02
5.	Linear Transformation-1	04
6.	Linear Transformation-2	02
7.	Inner Product Space-1	04
8.	Inner Product Space-2	02
9.	Beta and Gamma function-1	04
10.	Beta and Gamma function-2	02
	TOTAL	30

Text Book(s):

Title	**Author/s**	**Publication**
Thomas' Calculus	George B. Thomas, Maurice D. Weir and Joel Hass	Pearson
Elementary Linear Algebra	Howard Anton and Chrish Rorres	Wiley

Reference Book(s):

Title	**Author(s)**	**Publication**
Advanced Engineering Mathematics	E Kreyszig	John Wiley & Sons
A textbook of Engineering Mathematics	N P Bali and Manish Goyal	Laxmi
Higher Engineering Mathematics	B S Grewal	Khanna
Engineering Mathematics for First Year	T Veerarajan	Tata Mc Graw Hill
Engineering Mathematics-1 (Calculus)	H. K. Dass and Dr. Rama Verma	S. Chand

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average ofthe same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous evaluation consists of performance of tutorial which will be evaluated out of 10 Marks for each tutorial and average of the same will be converted to 50 marks.
- Continuous Evaluation consists of self-performance assignment to 20 marks.
- Internal Viva consists of 30 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SESH1120	**LINEAR ALGEBRA**
CO 1	Evaluate linear system using matrices and the knowledge of eigenvalues and eigenvectors for matrix diagonalization
CO 2	Determine the basis and dimension of vector spaces and subspaces.
CO 3	Discuss the matrix representation of a linear transformation given bases of the relevant vector space.
CO 4	Apply vectors, inner products, and linear transformations to real world situations.

CO 5	Classify gamma, beta functions & their relation which is helpful to evaluate some definite integral arising in various branch of engineering.

Mapping of CO with PO

SESH1120	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	3	1	1							3
CO 2	3	2	1								2
CO 3	2	2	1								3
CO 4	2	2	1	1							1
CO 5	2	1	1								1

Mapping of CO with PSO

SESH1120	PSO1	PSO2	PSO3
CO 1	2	3	3
CO 2	3	2	2
CO 3	2		2
CO 4	3	3	
CO 5	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Matrix Algebra	1, 2, 3, 4, 5, 6
2	Vector Space	1, 2, 3, 4, 6
3	Linear Transformation	1, 2, 3, 4, 6
4	Inner Product Space	1, 2, 3, 4, 5, 6
5	Beta and Gamma Function	1, 2, 3, 4, 5

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV1210
Course Name: Basics of Civil Engineering
Prerequisite Course/s: -

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
3	0	2	5	40	60	00	00	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective of the Course:
To help learners to

- Understand components of building, building terminology and construction materials.
- Understand building layout plan.
- Understand latest trends in civil engineering.
- Understand importance of various construction equipment.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**CIVIL ENGINEERING**: **AN OVERVIEW** Introduction, Branches, Scope, Impact, Role of Civil Engineer, Unit of measurement, Unit conversion (Length, Area, Volume).	04	10
2.	**INTRODUCTION TO CIVIL ENGINEERING MATERIALS:** List of materials, Details (types, properties, uses) of materials: Cement, Aggregate, Brick, Steel, Concrete, Stone, Soil, Mortar, Timber, Plastic, Epoxy, Flyash, Steel slag, Copper slag, Bitumen, Optical fiber, Pipe, Wire, Cable, Smart material, Basic hand fill tests.	08	12
3.	**BUILDING CONSTRUCTION:** Types of building, Components of building, Type of foundation and importance, Types of brick bonds, Principle of planning, Typical building layout, Symbols used in electrical layout, Symbols used for water supply, plumbing and sanitation. Nominal dimensions for door, window and furniture	10	20
4.	**INTRODUCTION TO TOWN PLANNING:** 5Principles of town planning, Necessity of town planning, Origin of town, Growth of town, Land use, Principles and objects of zoning, Advantages of zoning, Low cost housing, Prevention of slum, FSI.	04	10
5.	**INTRODUCTION TO SURVEYING AND LEVELLING:** Introduction: Fundamental principles, Classification. Linear measurement: Instruments used, Chaining on plane ground, Offset, Ranging. Angular measurement: Compass-Instrument used, Meridian, Bearing, Local attraction. Levelling: Instrument used, Terminology, Types of leveling, Methods of leveling. Modern tools: Introduction to theodolite, Total Station, GPS.	10	20
6.	**CONSTRUCTION EQUIPMENT:**	04	10

	Types of equipment- Functions, Uses. Hauling equipment-Truck, Dumper, Trailer. Hoisting equipment- Pulley, Crane, Jack, Winch, Sheave block, Fork truck. Pneumatic equipment-Compressor. Conveying equipment- package, screw, flight/scrap, bucket, belt conveyor. Drill, Tractor, Ripper, Rim pull, Dredger, Drag line, Power shovel, JCB, Hoe.		
7.	**RECENT TRENDS IN CIVIL ENGINEERING:** Mass Transportation, Rapid Transportation, Smart City, Sky scarper, Dams, Rain Water harvesting, Batch mix plant, Ready Mix Concrete plant, Green building, Earth quake resisting building.	05	10

List of Tutorial :

Sr. No	Name of Practical	Hours
1.	Unit conversation Exercise.	02
2.	Chart preparation of various materials.	02
3.	Different types of brick bonds.	04
4.	Layout of residential building.	02
5.	Introduction Linear and angular measurements	02
6.	Introduction to Theodolite	04
7.	Introduction to Dumpy level.	02
8.	Introduction to total station.	04
9.	Videosshowing working of construction Equipments.	04
10.	Presentation on various topics as in module 7 about recent trends.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Elements of civil engineering	Anurag A. Kandya	Charotar Publication
Basic Civil Engineering	S. Ramamrutham	Dhanpatrai Publication

Reference Book(s):

Title	Author/s	Publication
Elements of civil engineering	Dr. R. K. Jain and Dr. P. P. Lodha	McGraw Hill Education
Basics of civil engineering	S.S. Bhavikatti	New age international Publishers

Web Material Links:

- http://nptel.ac.in/courses/105107122/
- http://nptel.ac.in/courses/105107157/
- http://nptel.ac.in/courses/105101087/
- http://nptel.ac.in/courses/105104100/

Course Evaluation:

Theory:

- Continuous evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 40 marks.
- External viva consists of 60 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SECV1210	BASICS OF CIVIL ENGINEERING
CO 1	Explain the fundamental concepts of civil engineering, including its branches, scope, roles, and basic unit conversions.
CO 2	Identify and describe the properties, types, and applications of common civil engineering materials such as cement, concrete, steel, and aggregates.
CO 3	Illustrate and apply principles of building construction, including components, foundations, brick bonds, and building planning/layout.
CO 4	Demonstrate basic knowledge and applications of surveying and levelling techniques, including modern instruments like total station and GPS.
CO 5	Explain concepts of town planning, construction equipment, and recent trends in civil engineering such as smart cities, green buildings, and sustainable practices.

Mapping of CO with PO

SECV1210	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	2	3	2	3		2		3	
CO 2	3	3	3		2		2	3	3		3
CO 3	3	2	2	2	3	3		2	2	1	
CO 4	3	3		3		2	3		2	3	
CO 5	3		3	2	2	1	2	3			

Mapping of CO with PSO

SECV1210	PSO1	PSO2	PSO3
CO 1	3	3	2
CO 2	2	3	3
CO 3	3	2	3
CO 4	3	3	3
CO 5	3	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Civil engineering: An overview	1, 2, 3
2	Introduction to civil engineering materials	1, 2
3	Building construction	1, 2
4	Introduction to surveying and levelling	1, 2
5	Introduction to town planning	1, 2, 3
6	Construction equipment	1, 2
7	Recent trends in civil engineering	1, 2,4

P P Savani University
School of Engineering
Department of Computer Engineering

Course Code: SECE1210
Course Name: Programming with C Essentials
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
3	2	0	4	40	60	40	60	0	0	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand the basic components of a computer system.
- identify an appropriate approach to computational problems.
- develop logic building and problem-solving skills.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Computers Programming:** Introduction to programs, its significance, classification of programming language, Selection of a programming language, Flow Charts and Algorithms.	04	10
2.	**Introduction to Constants, Variables and Data Types:** Features of C Language, the Structure of C Program, Types of Errors, Debugging, Tracing the Execution of the Program, Watching Variables Values in Memory. Character Set, C Tokens, Keyword and Identifiers, Constants and Variables, Data Types - Declaration and Initialization, User Define Type Declarations - Typedef, Enum, Basic Input, and Output Operations, Symbolic Constants, Overflow and Underflow of Data.	07	15
3.	**Operators, Expressions, and Managing I/O Operations:** Introduction to Operators and its Types, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associatively. Introduction to Reading a Character, Writing a Character, Formatted Input and Output.	05	10
4.	**Conditional Statements:** Decision Making & Branching: Decision Making with If and If - else Statements, Nesting of If-else Statements, The Switch and go-to statements, Ternary (?:) Operator. Looping: The while Statement, The Break Statement & The Do. While loop, The FOR loop, Jump within loops - Programs.	06	15
5.	**Arrays:** Introduction, One-dimensional Arrays, Two-dimensional Arrays, Concept of Multidimensional Arrays.	06	15
6.	**Strings:** Declaring and Initializing String Variables, Arithmetic Operations on Characters, Putting Strings Together, Comparison of Two Strings, String Handling Functions.	05	12
7.	**User-Defined Functions:**	06	13

	Concepts of User-defined Functions, Prototypes, function Definition, Parameters, Parameter Passing, Calling a Function, Recursive Function.		
8.	**Pointers:** Introduction to Pointers, Declaration and initialization of pointers, Pointer to pointer, pointer and array, pointer to array, array to pointer, function returning pointer.	06	10
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Draw Flow Chart and write algorithm for at least five problems.	02
2.	Introduction to C programming environment, compiler, Linker, loader, and editor.	02
3.	Write programs to implement basic elements of C programming (different input functions, different output functions, different data types, and different operators)	04
4.	Write programs to implement control structures (if statement, if-else statement, nested if-else statement, switch statement, break statement, goto statement)	04
5.	Write programs to implement looping constructs (for loop, while loop, do-while and nested for loop)	04
6.	Write programs to implement arrays. (1-D array, and 2-D array)	04
7.	Write programs to implement strings. (input, output, different string inbuilt functions)	02
8.	Write programs to implement user-defined functions. (function with/without return type, function with/without argument, function and array)	04
9.	Write programs to implement recursive function.	02
10.	Write programs to implement pointers.	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Programming in ANSI C	E. Balagurusamy	Tata McGraw Hill
Introduction to Computer Science	ITL Education Solutions Limited	Pearson Education

Reference Book(s):

Title	Author(s)	Publication
Programming in C	Ashok Kamthane	Pearson
Let Us C	Yashavant P. Kanetkar	Tata McGraw Hill
Introduction to C Programming	ReemaThareja	Oxford Higher Education
Programming with C	Byron Gottfried	Tata McGraw Hill

Web Material Link(s):

- http://www.digimat.in/nptel/courses/video/106104128/L01.html
- https://www.youtube.com/watch?v=3QiItmIWmOM

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of practical performance which should be evaluated out of 10 for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva-voce consists of 30 marks during End Semester Exam.

Course Outcome(s):

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

SECE1210	PROGRAMMING WITH C ESSENTIALS
CO 1	Observe and interpret the concepts for data representation, algorithms and coding methods in computer system.
CO 2	Immediately analyze the syntax and semantics of the "c" language and apply in program.
CO 3	Manage the less memory usage while developing the program.
CO 4	Classify the types of errors occur while running the program.
CO 5	Develop and utilize user-defined functions, arrays, strings and pointers in C for efficient data manipulation and code modularity.

Mapping of CO with PO

SECE1210	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	2	1							1	
CO 2	3	3	2	1	2					1	
CO 3	2	3	2	1	2		2				2
CO 4	2	3	1	2	1			2			
CO 5	3	3	3	2	3	2	2	2	1	1	2

Mapping of CO with PSO

SECE1210	PSO1	PSO2	PSO3
CO 1	2	3	
CO 2	3		3
CO 3	2	3	2
CO 4		3	2
CO 5	2	2	

Level of Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1.	Introduction to Computers Programming:	1,2
2.	Introduction to C, Constants, Variables and Data Types	1,2,3
3.	Operators, Expressions, and Managing I/O Operations	3,4
4.	Conditional Statements	2,3,4
5.	Arrays	2,3,5
6.	Strings	2,3
7.	User-Defined Functions	2,3,4,6
8.	Pointers	2,3,4,5

P P Savani University
School of Engineering

Department of Electronics & Communication

Course Code: SEEC1210
Course Name: Basics of Electrical and Electronics
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand fundamental concepts of electrical related to Voltage, Current etc. and principles of circuit analysis.
- Explore electrical components, learn measurement and instrumentation along with elementary understanding of electronics.

Course Content:

Module No.	Content	Hours	Weightage in %
1	**Basic Introduction to Electricity and Magnetism** Concept of Charge, Coulomb's law, Electric Field, Intensity of electric field, Electric lines of force, Properties of electric lines of force, Electric flux, Flux density, Potential Difference and Current, Concept of Magnetic field, Coulomb's law of magnetic force, Magnetic Lines of Force, Magnetic flux.	11	24
2	**DC Circuits and Electromagnetism** Electrical circuit elements (R, L and C): Resistor, capacitor, Inductor, Voltage and Current sources, Ohm's law, effect of Temperature on resistance, temperature coefficient, Series and parallel combinations of Resistors and capacitors, Kirchoff's current and voltage laws, Thevenin and Norton Theorems. Ampere's law, Lenz and Faraday's laws for electromagnetic induction, Self inductance, Mutual inductance. Examples	12	26
3	**AC Circuits** Representation of sinusoidal waveforms, peak and RMS values, Phasor representation of AC quantities, real power, reactive power, apparent power, power factor, Three phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three phase circuits. Examples	11	25
4	**Electronics** Classification of Solids: Energy levels in solids, Semiconductors, Intrinsic and Extrinsic Semiconductor, N-type & P-type semiconductors, P-N junction diode, Characteristics of P-N junction diode, Types of Diodes: Photo diode, Light Emitting Diode, Solar cell, PIN diode, Varactor diode, Zener diode, Advantages of Semiconductor Devices.	11	25

List of Practical:

Sr. No.	Name of Practical	Hours
1.	To understand various electronic devices/components.	04
2.	To understand various tools (devices and equipments) used in electrical and electronic circuits for measurements.	04
3.	To study cathode ray oscilloscope and to understand how to take measurement, time period and frequency.	02
4.	To verify ohm's law using ammeter and voltmeter.	02
5.	To study the series and parallel connections of resistors.	04
6.	To study the series and parallel connections of capacitors.	04
7.	To verify Kirchoff's Current and Voltage Law.	02
8.	To study I-V characteristics of Light Emitting diode (LED).	02
9.	To study I-V characteristics of Zener diode.	02
10.	To understand Faraday's law of electromagnetic induction.	04
	Total	**30**

Text Book(s):

Title	Author/s	Publication
Basic electrical engineering	T.N. Nagsarkar and M.S. Sukhija	Oxford University Press, 3rd edition.
Basic electrical engineering	D.P. Kothari and I.J. Nagrath	Tata McGraw-Hill Education, 2010
Fundamentals of Electrical Engineering	L. S. Bobrow	Oxford University Press, 2011
Electronic Principles	Albert Malvino & David J. Bates	McGraw-Hill Education, 7th edition.
Electronic Devices and Circuits	David A. Bell	Oxford University Press, 5th edition

Web Material Link(s):

- https://archive.nptel.ac.in/courses/108/105/108105112/
- https://archive.nptel.ac.in/courses/108/101/108101091/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of Performance and regular manual writing, checking of the practical throughout the semester consists 20 Marks.
- Internal viva or practical performance consist of 20 Marks.
- Practical performance/test of 30 marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

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

SEEC1210	BASICS OF ELECTRICAL AND ELECTRONICS
CO 1	Apply fundamental electrical laws (Ohm's Law, KCL, KVL) to analyze basic electrical circuits

	with resistors, capacitors, inductors, and sources.
CO 2	Analyze and solve electrical circuits using network theorems such as Thevenin's, Norton's, Superposition, and apply node and mesh analysis techniques.
CO 3	Evaluate the performance of AC and DC circuits by analyzing power components, power factor, transient and steady-state behavior of RLC circuits.
CO 4	Explain the working principles and applications of semiconductor devices including PN junction diode, rectifiers, BJT, JFET, and MOSFET.
CO5	Design and analyze basic digital circuits using number systems, logic gates, Boolean algebra, combinational and sequential circuits.

Mapping of CO with PO

SEEC1210	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	2	1								
CO 2	3	3	2	1							
CO 3	3	2	1	1							
CO 4	2	1	1								
CO 5	3	2	3	1	1				1		

Mapping of CO with PSO

SEEC1210	PSO1	PSO2	PSO3
CO 1	2		3
CO 2		2	2
CO 3	2	3	2
CO 4	2	2	
CO 5	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Basic Introduction to Electricity and Magnetism	1,2
2	DC Circuits and Electromagnetism	2,3,4,5
3	AC Circuits	2,3,4,5
4	Electronics	3,4,5

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1220
Course Name: Engineering Workshop
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
-	02	-	02	-	-	100	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- learn about the safety measures required to be taken while using working in workshop.
- learn about how to select the appropriate tools required for specific operation.
- learn about different manufacturing technique for production out of the given raw material.
- understand applications of machine tools, hand tools, power tools and welding process.

List of Practical:

Sr. No	Name of Practical	Hours
1.	Introduction and Demonstration of Safety Norms. Different Measuring Instruments.	02
2.	To Perform a Job of Fitting Shop.	06
3.	To Perform a Job of Carpentry Shop.	06
4.	To Perform a Job of Sheet Metal Shop.	06
5.	To Perform a Job of Black Smithy Shop.	04
6.	Introduction and Demonstration of Grinding & Hacksaw Cutting Machine.	02
7.	Introduction and Demonstration of Plumbing Shop & Welding Process.	04
	TOTAL	**30**

Text Book(s):

Title	Author(s)	Publication
Elements of Workshop Technology Vol. I	Hajra Chaudhary S. K.	Media promoters & Publishers
Workshop Technology Vol. I and II	Raghuvanshi B.S.	Dhanpat Rai & Sons

Reference Book(s):

Title	Author(s)	Publication
Workshop Technology Vol. I	W.A.J. Chapman	Edward Donald Publication
Workshop Practices	H S Bawa	Tata McGraw-Hill
Basic Machine Shop Practice Vol. I, II	Tejwani V. K.	Tata McGraw-Hill

Web Material Link(s):
- http://nptel.ac.in/course.php

Course Evaluation:
Practical:

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 10 for each practical and average of the same will be converted to 50 Marks.
- Internal Viva consists of 50 Marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEME1220	ENGINEERING WORKSHOP
CO 1	Understand the various measuring instruments.
CO 2	Understand the safety norms required in the workshop.
CO 3	Understand the application of various tools required for different operations.
CO 4	Remember the process of manufacture from a given raw material.
CO 5	Explain various manufacturing processes in machine shop.

Mapping of CO with PO

SEME1220	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2					2			2		1
CO 2						3		3	3		1
CO 3	2					2			1		1
CO 4	2								3		2
CO 5	2								3		2

Mapping of CO with PSO

SEME1220	PSO1	PSO2	PSO3
CO 1	3	2	
CO 2	2		2
CO 3	3	2	3
CO 4	2	2	2
CO 5	2	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Practical No	Content	RBT Level
1	Introduction and Demonstration of Safety Norms. Different Measuring	1, 2, 4
2	Instruments.	1, 2, 3
3	To Perform a Job of Fitting Shop.	1, 2, 3
4	To Perform a Job of Carpentry Shop.	2, 3, 4
5	To Perform a Job of Sheet Metal Shop.	2, 3, 4
6	To Perform a Job of Black Smithy Shop.	2, 3, 4
7	Introduction and Demonstration of Grinding & Hacksaw Cutting Machine.	2, 3, 4

P P Savani University
School of Engineering
Department of Computer Engineering

Course Code: SECE1220
Course Name: Digital Proficiency
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
3	0	0	3	40	60	0	0	0	0	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- provide foundational knowledge of digital tools and technologies.
- introduce the principles of digital communication, collaboration, and problem-solving.
- enhance awareness of emerging digital trends and their applications in engineering.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Digital Literacy** Overview of digital tools and their applications, Introduction to operating systems (Windows, Linux), Basics of file management and cloud storage solutions, Digital communication tools: Email, messaging platforms, and video conferencing tools (Zoom, Teams).	06	13
2.	**Office Productivity Tools** Word Processing: Document formatting, templates, and styles (MS Word/Google Docs). Presentation Tools: Slide design, animations (MS PowerPoint/Google Slides).	04	10
3.	**Data Handling and Analysis** Spreadsheets: Data entry, formulas, charts, pivot tables (MS Excel/Google Sheets). Introduction to data visualization tools (e.g., Tableau, Power BI, Google Data Studio). Applications of data analysis in engineering contexts. AI features in Excel and Google Sheets for predictive analysis.	07	15
4.	**Computational Problem-Solving** Introduction to algorithms and flowcharts. Solving simple engineering problems through programming. Applications of computational techniques in various engineering domains.	06	12
5.	**Cybersecurity and Ethical Practices** Understanding cybersecurity principles, Awareness of phishing, malware, and secure passwords, Digital footprints and privacy concerns, Ethical use of technology and copyright considerations.	05	12
6.	**Introduction to AI Tools and Applications** Overview of AI, Machine Learning, and their applications in engineering. Practical use of AI tools: ChatGPT for content creation and brainstorming, Canva for design and visual communication, GitHub Copilot for coding assistance. Ethical considerations in AI usage.	07	15
7.	**Emerging Technologies and Industry Trends**	07	15

	Overview of Industry 4.0 concepts: IoT, AI, Robotics, and Blockchain. Applications of emerging technologies in various engineering domains. Case studies: Smart cities, sustainable manufacturing, and automation. Preparing for future technological trends and job roles.		
8.	**Capstone Project and Case Study** Group project: Solve a practical engineering problem using digital tools. Case study presentations on the application of digital and AI tools in real-world scenarios.	03	08
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Digital Literacy for Dummies	Faithe Wempen	Wiley
Literacy in a Digital World: The Evolution and Development of Literacy Proficiency	Lorraine Dagostino, Jennifer Bauer, Michael Deasy, Ed.D., Kathleen Ryan	Rowman & Littlefield

Reference Book(s):

Title	Author(s)	Publication
Computer Fundamentals	P.K. Sinha and Priti Sinha	BPB Publications- 6th Edition
Microsoft Office 365: In Practice	Randy Nordell and Annette Easton	McGraw Hill Education- Latest Edition
Ethics for the Information Age	Michael J. Quinn	Pearson Education- 8th Edition
Industry 4.0: Managing the Digital Transformation	Alp Ustundag and Emre Cevikcan	Springer

Web Material Link(s):

- https://learn.microsoft.com/en-us/training/browse/
- https://www.ibm.com/think/topics/cybersecurity
- https://www.youtube.com/playlist?list=PLlKpQrBME6xLGL3Ty_1Wbd3nTZ_q_OKFQ

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

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

SECE1220	Digital Proficiency
CO 1	Demonstrate proficiency in using digital tools, operating systems, and cloud platforms for effective communication and collaboration.
CO 2	Create, edit, and manage professional documents, presentations, and spreadsheets using modern office productivity software.
CO 3	Analyze and visualize data using advanced spreadsheet features and data visualization tools to solve engineering problems.
CO 4	Identify cybersecurity risks, implement ethical practices, and safeguard digital assets in professional environments.
CO 5	Apply AI tools and understand emerging technologies like IoT and blockchain to address real-world engineering challenges.

Mapping of CO with PO

SECE1220	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	3		1	3			2	3		1
CO 2	3	2			3				3		1
CO 3	3	2	1	3	3						1
CO 4	3	2			3		3				1
CO 5	3	3	1		3						1

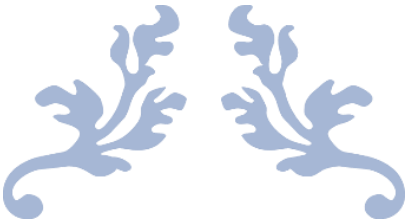
Mapping of CO with PSO

SECE1220	PSO1	PSO2	PSO3
CO 1	2		2
CO 2		2	3
CO 3	2	2	2
CO 4	2	3	
CO 5	3	2	2

Level of Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1.	Introduction to Digital Literacy	1,2,3
2.	Office Productivity Tools	2,3,4
3.	Data Handling and Analysis	2,3,4,5
4.	Computational Problem-Solving	2,3
5.	Cybersecurity and Ethical Practices	1,2,3
6.	Introduction to AI Tools and Applications	1,2,3,5
7.	Emerging Technologies and Industry Trends	3,4,5
8.	Capstone Project and Case Study	2,3,5,6



SECOND YEAR B.TECH

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
TEACHING & EXAMINATION SCHEME FOR B. TECH. BATCH : 2025 CIVIL (SUSTAINABLE) ENGINEERING															
Sem	**Course Code**	**Course Title**	**Offered By**	**Teaching Scheme**					**Examination Scheme**						
				Contact Hours				**Credit**	**Theory**		**Practical**		**Tutorial**		**Total**
				Theory	**Practical**	**Tutorial**	**Total**		**CE**	**ESE**	**CE**	**ESE**	**CE**	**ESE**	
3	SECV2260	Basics of Sustainable Energy	CV	3	0	2	5	5	40	60	0	0	40	60	200
	SECV2310	Mechanics of Solid	CV	3	2	0	5	4	40	60	40	60	0	0	200
	SEME2350	Fluid Mechanics	ME	3	2	0	5	4	40	60	40	60	0	0	200
		Elective-I	CV	3	2	0	5	4	40	60	40	60	0	0	200
		Elective-II	CV	3	2	0	5	4	40	60	40	60	0	0	200
						Total	**25**	**21**							**1000**
4	SEEE2360	Energy Storage & Technology	EE	3	0	2	5	5	40	60	0	0	40	60	200
	SEME2370	Energy Efficiency, Audit & Management	ME	3	0	2	5	5	40	60	0	0	40	60	200
	SECV2360	Sustainable and Green Transportation	CV	3	2	0	5	4	40	60	40	60	0	0	200
		Elective-III	CV	3	2	0	5	4	40	60	40	60	0	0	200
		Elective-IV	CV	3	2	0	5	4	40	60	40	60	0	0	200
						Total	**25**	**22**							**1000**

P P Savani University

School of Engineering
Department of Civil Engineering

Course Code: SECV2260
Course Name: Basics of Sustainable Energy
Prerequisite Course(s):

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners

- To introduce students to the fundamentals of sustainable energy systems and the need for transitioning from conventional to renewable energy sources.
- To develop an understanding of major renewable energy technologies such as solar, wind, biomass, hydro, geothermal, and emerging systems.
- To enable students to analyze, compare, and evaluate sustainable energy solutions based on technical, environmental, and economic criteria.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Sustainable Energy** Energy demand, supply, global trends; Environmental impacts of conventional energy; Concept of sustainability and energy transition; Overview of renewable vs. non-renewable sources; Energy metrics: efficiency, intensity, per-capita consumption.	04	10
2.	**Fundamentals of Energy Engineering** Review of thermodynamics relevant to energy systems; Energy conversion principles; Heat transfer basics; Power cycle fundamentals (Rankine, Brayton, refrigeration concepts); Efficiency limits (Carnot efficiency, exergy basics).	06	20
3.	**Solar Energy Technologies** Solar radiation basics, measurement, and estimation; Solar thermal systems: collectors, concentrators, applications; Photovoltaics: working principles, characteristics, modules, and arrays; Solar energy storage and integration; Case studies of solar power plants.	08	15

Module No.	Content	Hours	Weightage in %
4.	**Wind Energy Systems** Basics of wind formation and wind resource assessment; Aerodynamics of wind turbines; Types of wind turbines and components; Power curves, performance analysis; Grid integration and challenges.	06	20
5.	**Biomass and Bioenergy** Biomass resources and characterization; Thermochemical conversion: combustion, pyrolysis, gasification; Biochemical conversion: anaerobic digestion, fermentation; Biofuels: biogas, biodiesel, bioethanol; Waste-to-energy systems.	05	08
6.	**Hydropower and Geothermal Energy** **Hydropower:** Types of hydropower plants**;** Turbines and power calculations**;** Small, micro, and pico hydro. **Geothermal:** Geothermal resources and classification**;** Geothermal power plants; Direct use applications.	06	10
7.	**Ocean, Hydrogen, and Emerging Energy Technologies** Tidal, wave, and ocean thermal energy conversion (OTEC); Hydrogen energy: production, storage, fuel cells; Emerging and next-generation technologies (e.g., advanced nuclear, hybrid renewable systems).	04	10
8.	**Energy Storage, Economics & Sustainability Assessment** Energy storage systems: thermal, mechanical, electrical, chemical; Grid integration and smart energy systems; Life-cycle assessment (LCA); Techno-economic analysis of sustainable energy projects; Policy, regulatory framework, global & Indian scenario.	06	07
	TOTAL	45	100

List of Tutorials:

Sr. No	Name of Tutorial	Hours
1.	Energy Fundamentals and Sustainability Concepts	02
2.	Thermodynamics and Energy Conversion Basics	04
3.	Solar Radiation, PV, and Solar Thermal Analysis	04
4.	Wind Resource Assessment and Turbine Performance	04
5.	Biomass Characterization and Bioenergy Calculations	04
6.	Hydropower Potential and Turbine Calculations	04
7.	Geothermal, Ocean Energy, and Hydrogen Systems Overview	04
8.	Energy Storage, LCA, and Techno-Economic Evaluation	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Sustainable Energy: Engineering Fundamentals and Applications	Serdar Celik	Cambridge University Press

Reference Book(s):

Title	Author/s	Publication
Principles of Sustainable Energy Systems	Charles F. Kutscher, Jana B. Milford, Frank Kreith	CRC Press
Sustainable Energy Systems and Applications	İbrahim Dincer and Calin Zamfirescu	Springer
Energy Systems and Sustainability: Power for a Sustainable Future	Bob Everett	Oxford University Press

Web Material Link(s):

- https://nptel.ac.in/courses/103103206
- https://nptel.ac.in/courses/103107157
- https://nptel.ac.in/courses/109107397

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 masrks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during the End Semester Exam.

Course Outcome(s):

After the completion of the course, the student will be able to

SECV2260	Basics of Sustainable Energy
CO1	Explain basic concepts of sustainability and global energy challenges.
CO2	Describe the working principles and components of major renewable energy technologies.
CO3	Analyze energy potential and performance of solar, wind, biomass, and other systems.
CO4	Evaluate the environmental and economic impacts of different energy technologies.
CO5	Apply engineering fundamentals to propose sustainable and feasible energy solutions.

Mapping of CO with PO

SECV2260	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11
CO 1	2	1	1	1						2	1
CO 2	1	3	3		2		3	3	2	3	1
CO 3	2	3	1	1		2			3		1
CO 4	2	1	1		3	3	2	2		3	1
CO 5	2	2	1	1	2		3		2	3	1

Mapping of CO with PSO

SECV2260	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	2	3
CO 3	3	2	3
CO 4	3	2	3
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Sustainable Energy	1,2
2	Fundamentals of Energy Engineering	2,3,4,5
3	Solar Energy Technologies	2,3,4,5,6
4	Wind Energy Systems	4,5,6
6	Biomass and Bioenergy	4,5,6
7	Hydropower and Geothermal Energy	5,6
8	Ocean, Hydrogen, and Emerging Energy Technologies	5,6

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV2310
Course Name: Mechanics of Solids
Prerequisite Course/s: -

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand different types of forces, systematic evaluation of effect of these forces, behavior of rigid and deformable bodies subjected to various types of forces at the state of rest or motion of the particles.
- understand the stresses developed under the application of force.
- understand the physical and mechanical properties of materials.
- understand the behavior of structural elements under the influence of various loads.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction:** Definition of Rigid Body, Deformable Body, Scalar and Vector Quantities, Fundamental Principles of Mechanics: Principle of Transmissibility, Principle of Superposition, Law of Parallelogram of Forces.	05	10
2.	**Fundamental of Static:** Force, Types of Forces, Characteristics of a Force, System of Forces, Composition and Resolution of Forces. **Concurrent Forces:** Resultant of Coplanar Concurrent Force System by Analytical Method, Law of Triangle of Forces, Law of Polygon of Forces, Equilibrium Conditions for Coplanar Concurrent Forces. **Non-Concurrent Forces:** Moments & Couples, Characteristics of Moment And Couple, Varignon's Theorem, Resultant of Non-Concurrent Forces by Analytical Method, Equilibrium Conditions of Coplanar Non-Concurrent Force System.	06	15
3.	**Centroid and Centre of Gravity:** Centroid of Lines, Plane Areas and Volumes, Examples Related to Centroid of Composite Geometry, Pappus –Guldinus Theorems.	05	10

4.	**Moment of Inertia:** Parallel and Perpendicular Axis Theorems, Polar Moment of Inertia, Radius of Gyration of Areas, Examples related to moment of Inertia of Composite geometry.	06	10
5.	**Mechanical Properties of Materials:** Introduction, Classification of Materials, Properties Related to Axial, Bending, and Torsional & Shear Loading, Toughness, Hardness, Ductility, Brittleness. Proof stress, Factor of Safety, Working Stress, Load Factor.	06	15
6.	**Strain Energy Methods & Advanced Topics** Castigliano's theorems, virtual work, principle of minimum potential energy, Introduction to stability and buckling of beams and frames	04	10
7.	**Simple Stress and Strain:** Definition of Stress and Strain, Tensile & Compressive Stresses: Shear and Complementary Shear Strains, Linear, Shear, Lateral, Thermal and Volumetric. Hooke's Law, Stresses and Strain in bars of Varying, Tapering & Composite Section, Principle of Superposition. Elastic Constant, Relation between Elastic Constants.	05	10
8.	**Shear Force and Bending Moment:** Introduction, Types of Loads, Supports and Beams, Shear Force, Bending Moment, Sign Conventions for Shear Force & Bending Moment. Statically Determinate Beam, Support Reactions, SFD and BMD for Concentrated Load and Uniformly Distributed Load, Uniformly Varying Load, Point of Contra-flexure.	08	15
	TOTAL	45	100

List of Practical (Any Ten):

Sr. No	Name of Practical	Hours
1.	Equilibrium of coplanar concurrent forces	02
2.	To verify the law of parallelogram of forces	02
3.	To verify the law of polygon of forces	02
4.	To verify the Lami's theorem	02
5.	Equilibrium of parallel force system – simply supported beam	02
6.	Tensile test on Ductile materials.	02
7.	Compression test on Ductile materials	02
8.	Compression test on Brittle Materials	02
9.	Determination of hardness of metals (Brinell/ Rockwell hardness test)	02
10.	Determination of impact of metals (Izod/ Charpy impact test)	02
11.	Tutorial on concurrent & non-concurrent forces	04
12.	Tutorials on C. G & MI	02
13.	Tutorials on SFD & BMD	04
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Applied Mechanics	S. B. Junnarkar & H. J. Shah	Charotar Publication
Strength of Materials (SI Units)	R S Khurmi, N Khurmi	S. Chand & Company Pvt. Ltd.

Reference Book(s):

Title	Author(s)	Publication
Engineering Mechanics,	Meriam and Karaige,	Wiley-India
Engineering Mechanics: Statics and Dynamics	S Rajsekaran	Vikas Publication
Engineering Mechanics of Solids	Popov E.P	Prentice Hall of India
Strength of Materials (SI Units)	Er. R . K. Rajput	S. Chand & Company Pvt. Ltd.
Mechanics of Structure-Vol.I	Dr. H.J. Shah & S. B. Junarkar	Charotar Publishing House Pvt. Ltd.
Strength of materials	R. Subramanian	Oxford Publications
Strength of materials	S. Ramamrutham	DhanpatRai Publishing Company
Strength of Materials (SI Units)	Er. R . K. Rajput	S. Chand & Company Pvt. Ltd.

Web Material Link(s):

- http://nptel.ac.in/courses/122104014/
- http://nptel.ac.in/courses/112103108/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during the End Semester Exam.

Course Outcome(s):

After the completion of the course, the student will be able to

SECV2310	MECHANICS OF SOLIDS
CO 1	Understand and apply the fundamental principles of mechanics such as transmissibility, superposition, and equilibrium to analyze forces, moments, and resultants acting on rigid and deformable bodies.
CO 2	Determine geometric properties such as centroid, center of gravity, and moment of inertia of simple and composite sections, essential for structural and mechanical design.
CO 3	Explain and evaluate the mechanical properties of materials and relate them to behavior under different types of loading such as axial, bending, shear, and torsion.
CO 4	Analyze stresses, strains, and deflections in structural members subjected to different loading and boundary conditions using classical and energy methods.
CO 5	Construct shear force and bending moment diagrams for beams under various loading conditions and identify critical points such as points of contra-flexure to aid in safe and

	economical structural design

Mapping of CO with PO

SECV2310	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	3	2		2					3	
CO 2	2	2	3	2	2	2	2	3	2	2	3
CO 3	3	3	3	3	3	3	2	2	2	3	3
CO 4	2	3		2	2		3	3	2		
CO 5	3	2	3	3	3	3	2		3	2	3

Mapping of CO with PSO

SECV2310	PSO1	PSO2	PSO3
CO 1	3		3
CO 2	3	2	2
CO 3	3	3	
CO 4	2	2	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1, 2,
2	Fundamental of Static	2, 3, 4
3	Centroid and Centre of Gravity	2, 4, 5
4	Moment of Inertia	3, 4, 5
5	Mechanical Properties of Materials	1, 2, 5
6	Simple Stress and Strain	2, 4, 5
7	Shear Force and Bending Moment	3, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME2350
Course Name: Fluid Mechanics
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objectives of the Course:
To help learners to

- comprehend basic fundamentals of Fluid Mechanics, which is used in the applications of Aero-dynamics, Hydraulics & Hydraulic structures, Marine Engineering, Gas dynamics, Irrigation Systems etc.
- learn about Fluid Properties and characteristics.
- understand the importance of flow measurement and its applications in Industries and to study the various loss of flow in a flow system.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Properties of Fluids** Mass density, specific weight, specific gravity, specific volume, vapour pressure, compressibility and Bulk modulus, elasticity, surface tension, capillarity; Newton's law of viscosity, classification of fluids.	02	05
2.	**Fluid Statics** Force and Pressure, Pascal's law of Pressure at a point, Pressure measurement by Manometers – U tube, Inclined U tube, Differential U-tube, Centre of Pressure, Hydrostatic forces on surface – Vertical, Horizontal and Inclined, Forces on curved Surfaces, Buoyancy and Buoyant Force, Centre of Buoyancy and Meta Centre, Determination of Metacentric Height, Stability of Floating and Submerged Body, Position of metacenter relative to Centre of buoyancy.	07	15
3.	**Hydrostatic Forces on Surfaces** Total pressure and Centre of Pressure, Vertical Plane Surface Sub-merged in Liquid, Horizontal Plane Surface Sub- merged in Liquid, Inclined Plane Surface Sub- merged in Liquid, Curved Plane Surface Sub- merged in Liquid, Total pressure and Centre of Pressure on Lock Gates.	06	15

4.	**Fluid Kinematics** Steady and Unsteady Flow, Laminar and Turbulent Flow, Compressible and Incompressible Flow, One – two- and three-Dimensional Flow, Uniform and Non-Uniform Flow, Rotational and Irrotational Flow, Source Flow, Sink Flow. Vortex flow	03	10
5.	**Fluid Dynamics** Newton's law of motion, Euler's Equation and its applications, Bernoulli's Equation and its applications, Momentum Equation, Pitot Tube, Determination of volumetric flow with pitot tube, Principle of Venturi meter, Pipe Orifice and Rotameter, Orifice and Mouthpieces, Classification of Orifices, Flow through an orifice, Flow through Mouthpiece, Classification of Notches and Weir, Flow through Weir, Flow through Notches, hydraulics Co-efficient (Cv, Cc, Cv).	09	25
6.	**Flow Through Pipes** Major and Minor Losses in Pipes, Losses in Pipe Fittings, Hydraulic Gradient line and Total energy line, Equivalent Pipes, Pipes in series and parallel, Syphon, Power transmission through pipe, Flow through Nozzle, Water Hammer in Pipes.	08	15
7.	**Dimensional Analysis** Dimension, Derived quantities, Dimensional formula, unit conversion, Buckingham pie theorem, similarities (geometrical, dynamic, kinematics), model testing,	06	10
8.	**Forces on submerged bodies** Drag and Lift, Expression for Drag and Lift, Drag on Sphere and Cylinder, Development of Lift on a Circular Cylinder, Development of Lift on an Airfoil.	04	05
	TOTAL	**45**	**100**

List of Practical: (30 Hours of performance)

Sr No	Name of Practical	Hours
1.	Determine metacentric height of floating body	02
2.	Verification of Bernoulli's Equation	04
3.	Flow Identification using Reynold's Apparatus	04
4.	Measurement of velocity of flow using Pitot tube	04
5.	Calibration of Flow measuring devices: Venturi meter and Orifice meter	04
6.	Calibration and Discharge over Notches (V, Rectangular, Trapezoidal)	04
7.	Measurement of Friction factor for Different pipes. (Losses due to pipe fittings)	04
8.	Determination of Loss of Head Due Minor Losses Sudden Enlargement & Sudden Contraction	04
	Total	**30**

Text Book(s):

Title	Authors	Publication
Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications

Reference Books:

Title	Author/s	Publication
Fluid Mechanics	Frank M. White	Tata McGraw Hill Publication
Fluid Mechanics	R. K. Rajput	S. Chand Publication

Web Material Link(s):

- http://nptel.ac.in/courses/112105171/1

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEME2350	FLUID MECHANICS
CO 1	Differentiate fluid properties and its behavior in static and dynamic mode.
CO 2	Apply dimensional analysis to design the system and interpret types of fluid flow.
CO 3	Determine major and minor losses through different pipes.
CO 4	Diagnose the viscosity of fluids.
CO 5	Diagnose pressure exerted by the fluids and rate of flow of fluids.

Mapping of CO with PO

SEME2350	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2			2					3		
CO 2	3	2	2	3					3		
CO 3	3	2		3					3		
CO 4	3	3		3					3		
CO 5	3	1		3					3		

Mapping of CO with PSO

SEME2350	PSO1	PSO2	PSO3
CO 1		2	
CO 2	3	3	
CO 3	3	3	
CO 4	3	3	
CO 5		2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Properties of Fluids	1, 2
2	Fluid Statics	1, 2, 5
3	Fluid Kinematics	1, 2, 5
4	Fluid Dynamics	2, 3, 4, 5
5	Dimensional Analysis	2, 3, 5
6	Flow Through Pipes & Open Channels	2, 3, 4, 5
7	Viscous Flow	2, 3, 4, 5
8	Boundary Layer Theory	2, 3, 4, 5

P P Savani University
School of Engineering
Department of Civil Engineering

Course Code: SECV2330
Course Name: Concrete Technology
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand the basics of modern concrete.
- use mineral and chemical admixtures.
- understand the material properties of concrete with emphasis on its durability.
- design the required concrete mix based on the field conditions.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Properties of Cement & Aggregates** Production, composition and properties, cement chemistry, types of cements, special cements,	08	18
2.	**Chemical and Mineral Admixtures** Water reducers, air entrainers, set controllers, specialty admixtures structure properties, and effects on concrete properties, introduction to supplementary cementing materials and pozzolans, fly ash, blast furnace slag, silica fume, and metakaolin – their production, properties, and effects on concrete properties, other mineral additives – reactive and inert.	06	13
3.	**Concrete Mix Design** Basic principles, IS method, ACI method, new approaches based on rheology and particle packing.	07	16
4.	**Concrete Production & Fresh Concrete** Batching of ingredients, mixing, transport and placement. Consolidation, finishing, and curing of concrete, initial and final set – significance and measurement. Workability of concrete and its measurement.	02	03

5.	**Engineering Properties of Concrete** Compressive strength and parameters affecting it, tensile strength – direct and indirect, modulus of elasticity and Poisson's ratio, stress strain response of concrete.	05	11
6.	**Dimensional Stability and Durability** Creep and relaxation, parameters affecting, shrinkage of concrete – types and significance, parameters affecting shrinkage, measurement of creep and shrinkage**.**	06	13
7.	**Durability of Concrete** Introduction to durability, relation between durability and permeability, chemical attack of concrete, corrosion of steel rebars, other durability issues**.**	07	16
8.	**Special Concretes** Properties and Applications of: High strength – high performance concrete, reactive powder concrete, lightweight, heavyweight, and mass concrete, fibre reinforced concrete, self-compacting concrete, shotcrete, other special concrete.	04	10
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Fineness of Cement	02
2.	Soundness of Cement	02
3.	Slump cone test	02
4.	Compaction factor test	02
5.	Vee Bee Consistometer test	02
6.	Flow table test	02
7.	Compressive strength Tests	02
8.	Split Tensile Test	02
9.	Mix design	06
10.	Young's Modulus and Poisson's Ratio of concrete	04
11.	Rebound Hammer Test	02
12.	Ultrasonic Pulse Velocity Test	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Concrete Technology	A.M. Neville and J.J. Brooks	ELBS
Concrete Technology	M.S. Shetty	S. Chand

Reference Book(s):

Title	Author/s	Publication
Concrete Structure, Material and Properties	P.K. Mehta	Prantice Hall Inc.
Cement based composites: Materials, Mechanical Properties and Performance	A.M. Brandt	E & FN Spon.

Web Material Link(s):

- https://onlinecourses.nptel.ac.in/noc18_ce20/preview
- https://onlinecourses.nptel.ac.in/noc18_ce21/preview

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during the End Semester Exam.

Course Outcome(s):

After the completion of the course, the student will be able to

SECV2330	**CONCRETE TECHNOLOGY**
CO 1	Understand the process of manufacturing of cement and also identify the materials used for the concrete production.
CO 2	Determine the various key properties of cement by performing various tests as per Indian standards.
CO 3	Prepare a mix design for different grades of concrete and evaluate the performance by conducting tests on fresh and hardened concrete.
CO 4	Discover and generate a report on various factors causing failure in concrete.
CO 5	Understand and determine the types of special cements used in the industry.

Mapping of CO with PO

SECV2330	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11
CO 1	3		3	3	3	3	3	3	3		3
CO 2	3	3	3	3	2	3	3	2		3	33
CO 3	2	3	3	3	3		3		3		
CO 4	3	2	3		3	2		3	3	3	3
CO 5	2	2	2	3	3	2	2	3	2		3

Mapping of CO with PSO

SECV2330	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	2	2	2
CO 3	3	2	3

CO 4	2	2	2
CO 5	3	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Properties of Cement & Aggregates	1,2,3
2	Chemical and mineral admixtures	1,2,3
3	Concrete Mix Design	1,2,3
4	Concrete Production and Fresh Concrete	1,2,3
5	Engineering Properties of concrete	1,2,3
6	Dimensional Stability and Durability	1,2,3
7	Durability of concrete	1,2,3
8	Special Concretes	1,2,3

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV2320
Course Name: Building Materials & Construction Technology
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- develop conceptual knowledge in building materials & Construction.
- select appropriate material in a given field situation.
- develop ideas about various building components.
- develop awareness about Smart building materials.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction** Physical, chemical and engineering properties of building materials. Factors Affecting Choice of Materials, Application of building materials.	02	03
2.	**Brick & Blocks** Classification of clay products, Types of bricks, Properties and requirements of bricks, Manufacturing process of bricks, Test on bricks, Standard requirements and grades of bricks as per BIS.	02	07
3.	**Rocks/Stones** Classification of rocks, Rock products, Characteristics of stones - Structure, texture, strength, gravity, porosity, absorption, hardness, durability, weight. etc., Standard requirement of building stone, Important stones used in construction with its suitability.	06	07
4.	**Concrete** **Lime:** Sources and classification of Lime, Uses of lime with specific field situation, Types of pozzolanic materials, Advantages of addition of pozzolanic material. **Cement:** Types of cement with their specific use, Grade of cement as per BIS, Engineering properties of cement, Field and laboratory test of cement as per BIS. **Aggregate:** Types of aggregate as per BIS, Requirements of	12	20

	aggregate as per BIS, Engineering properties of aggregate, Test on aggregate. **Steel:** Classification of Ferrous materials(With Grade), Properties of Steel, Requirements of Steel, Uses of Steel for Construction **Admixtures:** Types of Admixture, Requirements of Admixtures, Use of Admixtures **Water:** Properties of Water use for construction **Concrete:** Requirements of concrete, Properties of fresh and hardened concrete, Types of concrete, Water-Cement ratio, Grades of concrete, Curing of concrete, Water-Cement ratio, Test on Concrete **Reinforced Concrete**: Pre -cast and cast -in -situ Construction		
5.	**Foundation** Function and requirements of a good foundation, Types of foundations, • **Shallow Foundations:** Types of Shallow foundation, Strip footing, Spread or I solated footing, Combined footing Strap, Mat or raft Foundation. • **Deep Foundation:** Caisson & Pile foundation • **Column Footing:**	05	08
6.	**Super Structure** a) Doors: Location, technical terms, size, types, construction, suitability. b) Windows: Factors affecting selection of size, shape, location and no. of windows, types, construction, suitability, fixtures and fastenings. c) Ventilators: Ventilators combined with window, fan light d) Column: e) Lintel: f) Beam: g) Slab: **Stairs and Staircases:** Definition, technical terms, requirements of good stair, fixing of going and rise of a step, types of steps, classification, example – stair planning, elevators, escalators. **Floorings:** Introduction, essential requirements of a floor, factors affecting selection of flooring material, types of ground floors, brick, flagstone, tiled cement concrete, granolithic, terrazzo, marble, timber flooring, upper floor - timber, timber floor supported on RSJ flag stone floor resting on RSJ, jack arch floor, reinforced concrete floor. **Roofs and Roof Coverings:** Introduction, requirements of good roof technical terms, classification, types of roof coverings for pitched. roof. A.C. sheet roofs – fixing of A.C. sheets, G.I. Sheets roofs, slates, flat roof – advantages, Dis-advantages, types of flat terraced roofing.	08	17

7.	**Masonry** **Brick masonry**: Technical terms, bonds in brick work- English bond, single & double Flemish bond, garden wall bond, raking bond, Dutch bond. **Stone masonry**: Technical terms, lifting appliances, joints, types – random (uncoursed) rubble, coursed rubble, dry rubble masonry, Ashlar masonry- Ashlar fine, chamfered fine. **Composite masonry**: Stone facing with brick backing, brick facing with concrete backing, Hollow concrete blocks and construction, AAC blocks **Cavity walls:** Brick cavity walls, position of cavity at foundation, roof and at opening levels. Fly ash Brick, Composite Masonry Unit	06	08
8.	**Miscellaneouss** Wall Finishes: Plastering, pointing and painting **Temporary Works:** Timbering in trenches, types of scaffoldings, shoring, underpinning **Special Treatments:** Fire resistant, water resistant, thermal insulation, acoustical construction and anti -termite treatment. **Green building:** Definition, materials construction, rating system, case study **3D Printing:** Introduction	04	17
	TOTAL	45	100

List of Practical:

Sr. No.	List of Practical/Exercise	Hours
1.	Conduct local market survey and Prepare a report for different civil engineering materials with respect to applications, cost and quality (Home assignment).	04
2.	Perform tests on given sample of brick such as ● Soundness ● Water absorption ● Compressive strengtsh ● Length & width of 20 bricks	04
3.	Identification of different types of stones and lime	02
4.	Conduct field test on given sample of brick and cement	02
5.	Perform lab tests on given sample of cement ● Standard Consistency ● Initial and final setting time	04
6.	Conduct field test on given sample of fine and coarse aggregate	02
7.	Perform Sieve analysis test on given sample of fine aggregate	02
8.	Assess the quality of different types of timber and timber products (visit nearby saw mill or timber mart)	02
9.	Prepare Sketch Book for various Building components.	08
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Building Materials & Construction	B. C. Punamia	Laxmi Publications

Reference Book(s):

Title	Author/s	Publication
Building Construction	Sushil Kumar	Standard Publication
Building Construction	Rangwala	Charator Publishing house
Building Materials	S. K. Duggal	New Age Publications
Building Materials	Varghese	PHI learning pvt.Ltd.
Building Construction	Bhavikatti	Vikas Publishing

Web Material Link(s):

- http://www.nptelvideos.in/2012/11/building-materials-and-construction.html
- https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2330
- http://www.vssut.ac.in/lecture_notes/lecture1424085991.pdf
- http://nptel.ac.in/courses/105102088/13
- https://www.classle.net/category/tagskeywords/civil-building-materials-and-construction
- http://www.geethanjaliinstitutions.com/engineering/coursefiles/downloads/civil/bmcp.pdf
- https://theconstructor.org

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical/tutorial/sketch book which will be evaluated out of 10 marks for each practical/tutorial/sketch book and average of the same will be converted to 20 marks.
- Internal viva component of 20 marks.
- Practical performance/quiz/drawing/test of 30 marks during end semester exam.
- Viva/Oral performance of 30 marks during end semester exam.

Course Outcomes:

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

SECV2320	BUILDING MATERIALS & CONSTRUCTION TECHNOLOGY
CO 1	Execute the engineering principles relevant to civil engineering materials.
CO 2	Examine the properties and conduct tests on cement, brick & aggregate.
CO 3	Understand masonry, finishing and form work standards.

CO 4	Identify the components of building and differentiate various types of building materials depending on its function.
CO 5	Understand the impact of building construction on society.

Mapping of CO with PO

SECV2320	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11
CO 1	3	3		2		2		3	2	2	
CO 2	2	3	3	3	3	3		3		2	3
CO 3	3	2	2	3	3	3	3		3	3	
CO 4		3	3	3	2	2		2		2	2
CO 5	3		2	2	3			3	2	2	3

Mapping of CO with PSO

SECV2320	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	2	3	2
CO 3	3	3	2
CO 4	2	2	2
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction	1, 2
2	Bricks & Blocks	1, 2, 3
3	Rocks	1, 2, 3
4	Concrete	2, 3, 4, 6
5	Foundation	2, 3, 4
6	Super structure	2, 3, 4, 5
7	Masonry	2, 3
8	Miscellaneous	2, 3

P P Savani University
School of Engineering
Department of Electrical Engineering (Sustainable Energy)

Course Code: SEEE2520
Course Name: Basics of Biomass and Bioenergy Systems
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	05	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

- To provide fundamental knowledge of biomass resources and their characteristics for sustainable energy production.
- To understand various biomass conversion technologies, including thermochemical and biochemical processes.
- To develop the ability to evaluate bioenergy systems, their applications, and their environmental and economic impacts.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Biomass & Bioenergy:** Definition, classification, importance; global & national energy scenario; role of biomass; advantages & limitations	05	11
2.	**Biomass Resources & Characteristics:** Types of biomass; physical, chemical & biological properties; proximate & ultimate analysis; resource assessment methods	06	13
3.	**Biomass Conversion Technologies – Overview:** Conversion pathways (thermochemical, biochemical, mechanical); comparison; energy balance & efficiency	05	11
4.	**Thermochemical Conversion:** Combustion; gasification; pyrolysis; bio-oil & biochar; factors affecting processes	06	13
5.	**Biochemical Conversion:** Anaerobic digestion; fermentation; biogas composition; microbial fuel cells basics; key parameters	06	13
6.	**Liquid Biofuels:** Biodiesel production; transesterification; feed stocks; quality standards & applications	05	11
7.	**Biomass Resource Management & Supply Chain:** Biomass collection, preprocessing, storage; logistics; sustainability; environmental impacts; LCA basics	04	9
8.	**Applications, Policies & Future Trends:** Biomass power plants; government policies & subsidies; emerging technologies; challenges & future prospects	03	7
	TOTAL	45	100%

List of Practical:

Sr. No	Name of Practical	Hours
1	To determine moisture content, volatile matter, ash content, and fixed carbon in various biomass samples.	06
2	To measure the calorific value of different biomass sources using a bomb calorimeter.	06
3	To set up a small-scale anaerobic digester using organic waste and observe biogas generation.	06
4	To produce biodiesel from vegetable oil or used cooking oil through the transesterification process.	06
5	To perform slow pyrolysis of biomass and analyze the resulting bio-oil, biochar, and gases.	06
	TOTAL	30

Text Book (s):

Title	Author/s	Publication
Biomass and Bioenergy: Processing and Properties	Khalid Rehman Hakeem, Mohammad Jawaid & Umer Rashid	Springer

Reference Book (s):

Title	Author/s	Publication
Bioenergy Research: Basic and Advanced Concepts	Manish Srivastava, Neha Srivastava & Rajeev Singh	Springer
Fundamentals of Biofuels Engineering and Technology	Cataldo De Blasio	Springer

Web Material Link(s):

- https://nptel.ac.in
- https://nitw.ac.in

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEEE2520	BASICS OF BIOMASS AND BIOENERGY SYSTEMS
CO 1	Understand basics of biomass and bioenergy.
CO 2	Identify biomass resources and their characteristics.
CO 3	Explain biomass conversion technologies.
CO 4	Describe biofuel production processes.
CO 5	Evaluate applications, sustainability, and policies in bioenergy systems.

Mapping of CO with PO

SEEE2520	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

CO 1	3	2	1	1	1	2	3	1	1	1	1
CO 2	3	3	1	2	1	2	3	1	1	1	1
CO 3	3	3	2	2	2	1	2	1	1	1	1
CO 4	3	3	2	3	2	1	2	1	1	1	1
CO 5	3	3	3	3	3	2	3	1	2	1	2

Mapping of CO with PSO

SEEE2520	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2	3	3
CO 3	2	3	2
CO 4	3	2	3
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Biomass & Bioenergy	1,2
2	Biomass Resources & Characteristics	2,3
3	Biomass Conversion Technologies – Overview	2,4
4	Thermochemical Conversion	2,4
5	Biochemical Conversion	2,4
6	Liquid Biofuels	2,3
7	Biomass Resource Management & Supply Chain	2,4,5
8	Applications, Policies & Future Trends	6

P P Savani University

School of Engineering

Department of Civil Engineering

Course Code: SECT2510
Course Name: Green Technology
Prerequisite Course(s):

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners

- To provide students with fundamental knowledge of green buildings principles, sustainability concepts, and environmental impacts of construction.
- To develop an understanding of green building design strategies related to site planning, materials, energy, water, and indoor environmental quality.
- To equip students with the skills needed to evaluate, plan, and manage sustainable construction projects following recognized green building standards and rating systems.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Green Buildings & Sustainability Concepts** Definition, need, and evolution of green buildings; Sustainability pillars: environmental, economic, social; Global and Indian green building movement (LEED, BREEAM, GRIHA); Life-cycle thinking: cradle-to-cradle vs cradle-to-grave; Benefits and challenges of green construction	03	10
2.	**Green Building Standards, Codes & Rating Systems** Overview of major rating tools: LEED, BREEAM, Green Globes, GRIHA; Energy Conservation Building Code (ECBC – India); Certification process: prerequisites, credits, scoring; Documentation and submission procedures; Case studies of certified green buildings	04	20
3.	**Sustainable Site Planning & Development** Site selection principles; Land use, topography, and ecosystem considerations; Stormwater management; Heat Island reduction techniques; Transportation planning & pedestrian-friendly design; Landscape planning for sustainability	04	15

Module No.	Content	Hours	Weightage in %
4.	**Sustainable Building Materials & Resources** Green materials: low-VOC, recycled content, regionally sourced; Life-cycle assessment (LCA) of building materials; Construction waste reduction, reuse, and recycling; Innovations: green concrete, fly-ash bricks, recycled aggregates; Environmental impacts of traditional vs green materials	04	20
5.	**Energy-Efficient Building Design** Building envelope: insulation, roofs, windows, glazing; Passive design strategies (orientation, shading, ventilation); HVAC efficiency improvements; Lighting design and daylighting; Renewable energy integration (solar PV, solar thermal, wind); Energy modeling & performance simulation	03	08
6.	**Water Efficiency & Sustainable Plumbing Systems** Water-efficient fixtures & fittings; Rainwater harvesting systems; Greywater recycling & onsite treatment; Sustainable landscape irrigation; Potable vs non-potable water use planning; Smart water monitoring technologies	04	10
7.	**Indoor Environmental Quality (IEQ)** Indoor air quality (IAQ) principles**;** Ventilation standards and strategies**;** Thermal comfort, acoustic comfort, lighting quality**;** Low-emission materials & pollutant control**;** Occupant health, well-being & productivity	04	10
8.	**Construction Management for Green Projects** Green construction project planning & scheduling**;** Cost implications and financial considerations**;** Green procurement & supply chain**;** Commissioning, measurement, and verification**;** Documentation during construction**;** post-occupancy evaluation**;** Case studies from Kubba's handbook	04	07
	TOTAL	30	100

List of Tutorials:

Sr. No	Name of Tutorial	Hours
1.	Basics of Green Buildings and Sustainability	02
2.	Understanding Green Building Rating Systems	04
3.	Sustainable Site Selection and Planning Exercises	04
4.	Evaluation of Green Building Materials	04
5.	Energy-Efficient Building Design Calculations	04
6.	Water Conservation and Recycling in Buildings	04
7.	Indoor Environmental Quality Assessment	04
8.	Green Construction Project Planning	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes	Sam Kubba	S Butterworth-Heinemann

Reference Book(s):

Title	Author/s	Publication
Sustainable Construction: Green Building Design and Delivery (5th Ed)	Charles J. Kibert	Wiley-Blackwell / John Wiley & Sons
Green Building: Principles and Practices in Residential Construction	Ross W. Kruger & Jason Seville	Cengage Learning
Green Building A to Z: Understanding the Language of Green Building	Jerry Yudelson	New Society Publishers

Web Material Link(s):

- https://nptel.ac.in/courses/105102195

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during the End Semester Exam.

Course Outcome(s):

After the completion of the course, the student will be able to

SECV2530	Green Technology
CO1	Students will be able to explain the principles of green building and sustainability and justify the need for eco-friendly construction practices.
CO2	Students will be able to differentiate and apply major green building rating systems (LEED, GRIHA, BREEAM) in evaluating building performance.
CO3	Students will be able to analyze sustainable design strategies for site planning, materials selection, energy efficiency, water conservation, and indoor quality.
CO4	Students will be able to perform basic calculations and assessments related to green building performance (energy modeling basics, water savings, material LCA, etc.).

CO5	Students will be able to plan and manage a green construction project, including documentation, cost implications, commissioning, and post-occupancy evaluation.

Mapping of CO with PO

SECT2510	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	2	1	1	1						2	1
CO 2	1	3	3		2		3	3	2	3	1
CO 3	2	3	1	1		2			3		1
CO 4	2	1	1		3	3	2	2		3	1
CO 5	2	2	1	1	2		3		2	3	1

Mapping of CO with PSO

SECT2510	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	2	3
CO 3	3	2	3
CO 4	3	2	3
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Green Buildings & Sustainability Concepts	1,2
2	Green Building Standards, Codes & Rating Systems	2,3,4,5
3	Sustainable Site Planning & Development	2,3,4,5,6
4	Sustainable Building Materials & Resources	4,5,6
6	Energy-Efficient Building Design	4,5,6
7	Water Efficiency & Sustainable Plumbing Systems	5,6
8	Indoor Environmental Quality (IEQ)	5,6

P P Savani University
School of Engineering
Department of Electrical Engineering (Sustainable Energy)

Course Code: SEEE2530
Course Name: Hybrid Renewable Energy Systems
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	05	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

- Analyze the working principles of solar, wind, and energy storage components.
- Design and optimally size reliable hybrid energy systems for different applications.
- Evaluate system operation, control strategies, and economic viability (LCOE).

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction & Solar PV System Fundamentals:** Need for Hybrid Renewable Energy Systems (HRES), Classification of HRES: Grid-connected, Stand-alone, DC, AC, and AC/DC coupled, Solar PV Module: Structure, I-V characteristics, Equivalent circuit model, Maximum Power Point Tracking (MPPT): Basic principle and P&O algorithm, Solar PV System Sizing and Balance of System (BOS) components.	06	14
2.	**Wind Energy Conversion Systems (WECS):** Wind Power Fundamentals: Wind speed characteristics, Betz limit, Power curve, Types of Wind Turbines: HAWT and VAWT, classification based on rotor speed (fixed vs. variable speed), WECS Components: Aerodynamics, blades, gearbox, generators (DFIG, PMSG - basic structure and application), Wind Farm Layout and site selection considerations.	06	14
3.	**Hybrid System Architectures & Power Electronics**: HRES Architectures, Key components of a typical PV-Wind HRES: Sources, Power Converters, Energy Storage, Power Conditioning Units (PCU): DC-DC converters, Inverters (VSC and CSC principles), Role of centralized and distributed converters in HRES integration.	06	13
4.	**Energy Storage Technologies for HRES:** Need for energy storage in HRES: Bridging intermittency, improving power quality, Battery Energy Storage Systems (BESS): Types (Lead-Acid, Li-ion, Flow batteries), Characteristics (Energy density, Cycle life, DOD), Modeling and Sizing of BESS for stand-alone and grid-tied applications, Other storage methods: Flywheel, Supercapacitors, Pumped Hydro Storage	06	13
5.	**HRES Modeling and Component Sizing:** Modeling of HRES Components: Mathematical models for PV array, Wind turbine,		

	and Battery, Load Estimation: Techniques for predicting daily, weekly, and seasonal load profiles, Methods for optimal component sizing: Loss of Power Supply Probability (LPSP), Reliability Index, Introduction to Simulation Tools for HRES analysis.	05	11
6.	**Control and Power Management Strategies:** Hierarchical Control of HRES: Primary, Secondary, and Tertiary control levels, Power Management Strategy (PMS): Load following, Cycle charging, Control strategies for stand-alone HRES: Coordinating power flow between sources, storage, and load, Grid-tied HRES control: Active and reactive power control, Grid synchronization.	05	11
7.	**Optimization and Economic Analysis:** Economic Analysis: Capital Cost (CC), Operating Cost (OC), Replacement Cost (RC), Cost of Energy (COE): Calculation and optimization, Net Present Cost (NPC) and Levelized Cost of Electricity (LCOE) calculations, Optimization techniques: Introduction to Genetic Algorithms (GA) and Particle Swarm Optimization (PSO) for HRES sizing and optimal operation.	06	13
8.	**Microgrids, Grid Integration, and Case Studies:** Introduction to Microgrids: Definition, types (AC, DC, Hybrid), advantages, Challenges of integrating HRES with the main grid (Harmonics, protection, islanding detection), Case Studies: Detailed analysis of two or three operational HRES projects, HRES Policies and Regulatory Frameworks	05	11
	TOTAL	**45**	**100%**

List of Practical:

Sr. No	Name of Practical	Hours
1	Measure and plot the I-V and P-V characteristics of a PV module under varying solar irradiation and temperature.	03
2	Simulate and implement a Perturb and Observe (P&O) or Incremental Conductance algorithm to track the maximum power point of a PV array.	03
3	Determine the performance characteristics of a small wind turbine, including the power-speed curve and tip-speed ratio calculation.	03
4	Perform charge/discharge cycle testing on a battery and estimate the State-of-Charge (SOC) and effective capacity.	03
5	Design and simulate a DC-DC (Buck/Boost) converter to regulate the voltage and current for charging a battery bank (using MATLAB/Simulink).	03
6	Simulate a three-phase Voltage Source Converter (VSC) and implement a basic control loop for grid synchronization and power injection.	03
7	Model a complex load profile. Perform component sizing for a PV-Wind-Battery system, running optimization to minimize the Net Present Cost (NPC) and calculating the LCOE.	06
8	Develop and simulate the full control logic (flowchart and Simulink model) for optimal power dispatch and coordination between all sources, storage, and the load/grid connection.	06
	TOTAL	30

Text Book (s):

Title	Author/s	Publication
Renewable and Efficient Electric Power Systems	Gilbert M. Masters	IEEE Press / Wiley

Reference Book (s):

Title	Author/s	Publication
Hybrid Renewable Energy Systems: Design and Control	K. Balamurugan, V. Balaji	CRC Press
Integration of Renewable Energy Sources with Smart Grid	Ali H. M. F. et al.	Springer

Web Material Link(s):

- https://nptel.ac.in
- https://nitw.ac.in

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEEE2530	Hybrid Renewable Energy Systems
CO 1	Analyze the dynamic constraints of all components in a hybrid system.
CO 2	Design the control logic for power dispatch and energy storage management.
CO 3	Simulate the HRES control strategy using specialized software (Simulink).
CO 4	Optimize power flow to maximize renewable energy utilization.
CO 5	Evaluate the system's performance during grid connection and islanding operations.

Mapping of CO with PO

SEEE2530	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	3	2	2	1	1	2	1	1	1	1
CO 2	2	3	3	1	1	1	2	1	1	1	1
CO 3	1	1	2	2	3	1	1	1	1	1	1
CO 4	2	3	2	3	2	2	3	1	1	1	2
CO 5	2	3	1	3	2	1	2	1	1	1	1

Mapping of CO with PSO

SEEE2530	PSO1	PSO2	PSO3
CO 1	3	2	1
CO 2	2	3	1
CO 3	2	3	1
CO 4	3	3	2
CO 5	2	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction & Solar PV System Fundamentals	1,3,4
2	Wind Energy Conversion Systems (WECS)	3,4
3	Hybrid System Architectures & Power Electronics	2,3
4	Energy Storage Technologies for HRES	2,3
5	HRES Modeling and Component Sizing	3,4
6	Control and Power Management Strategies	3,4,6
7	Optimization and Economic Analysis	3,5
8	Microgrids, Grid Integration, and Case Studies	2,5

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2360

Course Name: Entrepreneurship in Energy

Sector Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	04	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- Establish an entrepreneurial attitude to uncover fresh, technical business opportunities within the renewable and conventional energy sectors.
- Develop essential abilities in designing and assessing business models using frameworks like the Business Model Canvas.
- Analyze the financial viability of energy projects and determine necessary resources, finance, and regulatory pathways.
- Communicate and propose a clear business strategy, considering the legal and supply chain challenges of scaling an energy firm.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Entrepreneurship and Energy Transition** The Entrepreneurial Mindset: Characteristics of successful entrepreneurs; distinction between invention and innovation. Global Energy Overview: Current energy mix (Fossil Fuels, Nuclear, Renewables); the need for energy transition. Indian Energy Scenario: Policy drivers (e.g., National Solar Mission, PLI schemes); opportunities for small and medium enterprises. Role of Mechanical Engineers: Opportunities in manufacturing, project EPC (Engineering, Procurement, Construction), and O&M (Operation and Maintenance).	06	14

2.	**Ideation and Opportunity Identification** Need-Gap Analysis: Identifying unmet needs in the energy value chain (generation, transmission, storage, efficiency). Renewable Energy Opportunities: Focus on Solar PV (advanced mounting systems, cooling), Wind (Blade O&M, Drivetrain components), and Biomass. Energy Efficiency: Market for HVAC efficiency, energy auditing, and industrial heat recovery systems. The Idea Funnel: Techniques for generating, screening, and selecting the most viable business concept.	06	13
3.	**Business Model Development** Introduction to Business Models: Components of a successful business model. The Business Model Canvas (BMC): Detailed study of all nine blocks (Value Proposition, Customer Segments, Key Activities, etc.). Application to Energy Sector: Developing for different energy services (e.g., PV rooftop installer vs. EV battery recycler). Lean Startup Principles: Conceptual introduction to Minimum Viable Product (MVP) and validated learning.	06	13
4.	**Market Assessment and Strategy** Market Research: Primary and secondary research methods; identifying target customers (Industrial, Commercial, Residential). Market Sizing: Total Addressable Market (TAM), Serviceable Available Market (SAM), and Serviceable Obtainable Market (SOM) calculation (conceptual). Competitive Analysis: Identifying direct and indirect competitors; SWOT analysis. Go-to-Market Strategy: Basic concepts of sales channels, distribution, and marketing for energy products.	06	13
5.	**Project Finance and Financial Feasibility** Basic Financial Statements: Introduction to Profit & Loss (P&L) and Balance Sheet (conceptual). Project Cost Estimation: Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) for energy projects. Feasibility Metrics (Basic): Calculation of Simple Payback Period and concept of Discounted Cash Flow (DCF). Funding Sources: Bootstrapping, Angel Investors, Venture Capital (VC), and debt financing (bank loans).	05	11
6.	**Legal, Policy, and Regulatory Landscape** Business Registration: Types of legal entities (Sole Proprietorship, Partnership, Private Limited Company). Intellectual Property (IP): Importance of patents, trademarks, and copyright in technology. Key Energy Policies: Understanding Net Metering, Power Purchase Agreements (PPA), and Renewable Purchase Obligations(RPO).	05	11

	Safety and Standards: Relevant national and international standards (e.g., IEC, BIS) for energy products.		

7.	**Operations, Supply Chain, and Scaling** Supply Chain Management (SCM): Mapping the supply chain for renewable energy components (PV cells, wind blades, batteries). Logistics and Inventory: Management challenges in the project-based energy sector. Scaling Strategies: Challenges related to manufacturing capacity expansion and talent acquisition. Contract Management: Basics of EPC contracts and service level agreements (SLA).	05	11
8.	**Risk Management and Case Studies** Project Risk: Identifying technical, financial, and regulatory risks in energy projects. Mitigation Strategies: Insurance, diversification, and contingency planning. Case Studies: Analysis of successful and failed energy startups (e.g., in solar EPC, electric mobility, or green hydrogen). Pitching the Idea: Elements of an effective business plan and investor pitch deck.	06	14
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Case Study Analysis: Analyze the business model and success factors of a pre-selected, regional renewable energy SME.	02
2.	Idea Generation Workshop: Brainstorm and perform a basic SWOT analysis for 3 distinct, mechanically-focused energy startup ideas..	04
3.	Business Model Canvas Drafting: Draft the complete BMC for one of the selected ideas from T2.	04
4.	Value Proposition Design: Deep dive into the value proposition block, creating a 'jobs-to-be-done' matrix for the target customer.	04
5.	Market Sizing Exercise: Estimate the Serviceable Obtainable Market (SOM) for a chosen product (e.g., solar water pump maintenance service).	04
6.	Feasibility Calculation: Calculate the Simple Payback Period and Breakeven Point for a small rooftop PV project using provided cost data.	04
7.	Policy Analysis Report: Prepare a short report on the key incentives and subsidies available for a specific energy technology (e.g., waste-to-energy) in the state/country.	04
8.	Supply Chain Mapping: Draw a simplified supply chain map for a solar inverter or an EV battery pack, identifying key international and local suppliers.	04

	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Platform Business Models: Frameworks, Concepts and Design	R Srinivasan	Springer

Reference Book(s):

Title	Author/s	Publication
Business Policy and Strategic Management: Concepts and Applications	Vipin Gupta, Kamala Gollakota, and R. Srinivasan	PHI Publication

Web Material Links:

- http://nptel.ac.in/downloads/113106032/

Course Evaluation:

Theory:

- Continuous evaluation consists of two tests each of 30 marks and 1 hour of duration andaverage of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during the End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEME2360	Entrepreneurship in Energy
CO1	Explain the fundamental entrepreneurial mindset and identify the global and local market landscape of the conventional and renewable energy sectors.
CO2	Identify feasible business opportunities in technical areas relevant to mechanical engineers (e.g., HVAC optimization, solar mounting, EV components).
CO3	Develop a preliminary Business Model Canvas (BMC) for an energy startup, defining value propositions and key resources.
CO4	Analyze basic project finance methods (e.g., payback period) and identify potential funding sources, including government subsidies and venture capital.
CO5	Assess the legal, regulatory, and supply chain challenges associated with scaling an energy technology venture.

Mapping of CO with PO

SEME2360	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	2		1	1						2
CO 2	2	1	1	1	3		3				
CO 3	2		1	2	2	1	3		2		2
CO 4	2				3		3	1	2		
CO 5	2	3	1	2	3	1	3	1	2		2

Mapping of CO with PSO

SEME2360	PSO1	PSO2	PSO3
CO 1	1	1	1
CO 2	3	2	2
CO 3	3	2	2
CO 4	3	2	2
CO 5	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

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P P Savani University
School of Engineering
Department of Electrical Engineering (Sustainable Energy)

Course Code: SEEE2360
Course Name: Energy Storage & Technology
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	00	02	05	40	60	00	00	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

- This course aims to introduce the importance and application of energy storage systems and to familiarize with different energy storage technologies.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Energy storage systems overview** - Scope of energy storage, needs and opportunities in energy storage, Technology overview and key disciplines, comparison of time scale of storages and applications, Energy storage in the power and transportation sectors. Importance of energy storage systems in electric vehicles, Current electric vehicle market.	06	13.33
2.	**Thermal storage system**-heat pumps, hot water storage tank, solar thermal collector, application of phase change materials for heat storage-organic and inorganic materials, efficiencies, and economic evaluation of thermal energy storage systems.	06	13.33
3.	**Chemical storage system-** hydrogen, methane etc., concept of chemical storage of solar energy, application of chemical energy storage system, advantages and limitations of chemical energy storage, challenges, and future prospects of chemical storage systems.	05	11.11
4.	**Electromagnetic storage systems** - double layer capacitors with electrostatically charge storage, superconducting magnetic energy storage (SMES), concepts, advantages and limitations of electromagnetic energy storage systems, and future prospects of electrochemical storage systems.	05	11.11
5.	**Electrochemical storage system:** Batteries-Working principle of battery, primary and secondary (flow) batteries, battery performance evaluation methods, major battery chemistries and their voltages- Li-ion battery& Metal hydride battery vs lead-acid battery.	06	13.33
6.	**Super capacitors-** Working principle of super capacitor, types of super capacitors, cycling and performance characteristics, difference between battery and super capacitors, Introduction to Hybrid electrochemical super capacitors	04	8.89
7.	**Fuel cell:** Operational principle of a fuel cell, types of fuel cells,		

	hybrid fuel cell-battery systems, hybrid fuel cell-super capacitor systems.	04	8.89
8.	Battery design for transportation, Mechanical Design and Packaging of Battery Packs for Electric Vehicles, Advanced Battery-Assisted Quick Charger for Electric Vehicles, Charging Optimization Methods for Lithium-Ion Batteries, Thermal run-away for battery systems, Thermal management of battery systems, State of Charge and State of Health Estimation Over the Battery Lifespan, Recycling of Batteries from Electric Vehicles.	09	20.01
	TOTAL	45	100%

List of Tutorial:

Sr. No	Name of Tutorial	Hours
1	• Numerical problems on time-scale matching of storage with applications	02
2	• Numerical problems on thermal energy calculations (sensible & latent heat) • Heat pump COP calculation exercises • Phase change material selection & justification problems	10
3	• Problems on capacitor energy storage (EDLC) • SMES inductive energy and power calculations • Battery performance evaluation: SoC, DoD, C-rate numericals	10
4	• Hybrid battery–supercapacitor sizing numerical • Supercapacitor energy, power & cycle life calculations • Fuel cell efficiency & Nernst equation numericals	8
5		04
	TOTAL	30

Text Book (s):

Title	Author/s	Publication
Large Energy Storage Systems	Frank S. Barnes and Jonah G. Levine	CRC press

Reference Book (s):

Title	Author/s	Publication
Energy storage: A new approach	Ralph Zito	Wiley
Energy storage	Robert A. Huggins	Springer Science & Business Media

Web Material Link(s):

- https://nptel.ac.in
- https://nitw.ac.in

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEEE2360	**ENERGY STORAGE & TECHNOLOGY**
CO 1	Understand the scope, need, and applications of energy storage systems in power and transportation sectors.
CO 2	Explain thermal and chemical energy storage principles, materials, efficiencies, and limitations.
CO 3	Describe and compare electromagnetic and electrochemical storage systems including batteries and super capacitors.
CO 4	Understand fuel cell operation and hybrid energy storage configurations.
CO 5	Apply concepts of battery design, charging, thermal management, and safety in electric vehicle systems.

Mapping of CO with PO

SEEE2360	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	1	1	1	2	3	1	1	1	1
CO 2	3	3	1	2	1	2	3	1	1	1	1
CO 3	3	3	2	2	2	1	2	1	1	1	1
CO 4	3	3	2	3	2	1	2	1	1	1	1
CO 5	3	3	3	3	3	2	3	1	2	1	2

Mapping of CO with PSO

SEEE2360	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	3	3	2
CO 3	3	3	2
CO 4	3	3	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Overview of Energy Storage Systems	1,2
2	Thermal Energy Storage Systems	2,3
3	Chemical Energy Storage Systems	2,4
4	Electromagnetic Energy Storage Systems	2,4
5	Electrochemical Storage Systems – Batteries	2,4
6	Supercapacitors & Hybrid Storage	2,3
7	Fuel Cells & Hybrid Systems	2,4,5
8	Battery Systems for Transportation & Safety	3,4,5,6

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME2320
Course Name: Energy Efficiency, Audit & Management
Prerequisite Course(s):

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	40	60	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- identify the basics energy management and its requirement.
- interpret types of energy audit their significance and need.
- Understand audit planning and management with energy system and process.
- explore data collection, audit tools, analysis, energy conversion measures.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Energy Management** Energy basics and terminology, Global and national energy scenarios, Importance of energy efficiency. Regulatory frameworks, codes, and standards (ISO 50001, ASHRAE, etc.), Energy policies and sustainability goals	03	10
2.	**Types of Energy Audits** Preliminary/Walk-through audits, General/Typical audits Detailed energy audits, Investment-grade audits, Choosing the appropriate audit level	04	10
3.	**Audit Planning & Management** Audit objectives, scope, and boundaries, creating audit plans, schedules, and resource allocation, Stakeholder engagement and communication, Collecting baseline data & documentation review, Health, safety, and compliance considerations	04	15
4.	**Energy Systems and Process Review** **Electrical systems:** Motors, drives, transformers, power quality **HVAC systems:** Chillers, boilers, AHUs, cooling towers **Lighting systems:** Technologies, controls, daylighting **Industrial processes:** Steam systems, compressed air, furnaces, pumps Building envelope and thermal performance	10	20
5.	**Audit Tools, Instrumentation & Technology** Measurement and data-logging instruments, Thermal imaging	04	10

	and infrared analysis, Smart meters and IoT-based monitoring Energy modeling software (eQuest, RETScreen, etc.), Safety and calibration practices		
6.	**Data Collection & Analysis** Energy balance and benchmarking, Load profiling and consumption pattern analysis, Regression analysis and normalization, Utility bill analysis, Identifying anomalies and losses	04	10
7	**Identifying Energy Conservation Measures (ECMs)** Cost-effective vs. capital-intensive solutions, Automation & control strategies, Optimization of systems and operations Maintenance and behavioural ECMs, Renewable energy integration opportunities	06	10
8	**Financial & Economic Analysis** Cost–benefit analysis, Life cycle costing, Simple payback, NPV, IRR, ROI, Prioritizing ECMs based on economics and feasibility **Audit Report Preparation** Structure and components of a good audit report, Presenting findings and ECMs, Visuals, charts, baselines, and summary tables, Recommendations and implementation roadmaps Post-audit review and verification	10	15
	TOTAL	45	100

List of Tutorial:

Sr. No.	Name of Practical	Hours
1.	Audit and load calculation of all electrical appliances.	06
2.	Audit and load calculation of the mechanical appliances	06
3.	Baseline whole-building energy meter check	06
4.	Audit and load calculation of HVAC system.	06
5.	Fault detection and diagnosis of the system	06
	TOTAL	30

Text Book (s):

Title	Author/s	Publication
Energy Efficiency and Management for Engineers, 1st Edition	Mehmet Kanoğlu Yunus A. Çengel	McGraw hill

Reference Book(s):

Title	Author/s	Publication
Energy Management Conservation and Audits	Anil Kumar, Om Prakash, Prashant Singh Chauhan, Samsher Gautam	Routledge Taylor & Francis

Web Material Links:

- https://beeindia.gov.in/sites/default/files/1Ch3.pdf

Course Evaluation:

Theory:

Module No	Content	RBT Level
1	Introduction to Energy Management	1, 2
2	Types of Energy Audits	1, 2, 3
3	Audit Planning & Management	1, 2, 3
4	Energy Systems and Process Review	1, 2, 4,5
5	Audit Tools, Instrumentation & Technology	1, 2,3
6	Data Collection & Analysis	1,2,3,4
7	Identifying Energy Conservation Measures (ECMs)	1,2,4,5,6
8	Financial & Economic Analysis and Audit Report Preparation	1,2,3,5, 6

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 marks.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SEME2320	Energy Efficiency, Audit & Management
CO1	Understand the basic tool of the audit and system requires regular audit management.
CO2	Estimate the audit planning for various system like electrical, mechanical audits.
CO3	Understand the data collection and analyze techniques.
CO4	Relate with the financial & economic analysis with audit preparation
CO5	Understand the energy conservation measures.

Mapping of CO with PO

SEME2320	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1		2	3	2		3	3	1		3	
CO 2		1	3	3			3	1	3	3	
CO 3		2	3	2		3		1	3	3	
CO 4		2	3	3	3	3	3	1	3		
CO 5		2	3	2	3	3	3	1	3	3	

Mapping of CO with PSO

SEME2320	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Energy Management	1, 2
2	Types of Energy Audits	1, 2, 3
3	Audit Planning & Management	1, 2, 3
4	Energy Systems and Process Review	1, 2, 4,5
5	Audit Tools, Instrumentation & Technology	1, 2,3
6	Data Collection & Analysis	1,2,3,4
7	Identifying Energy Conservation Measures (ECMs)	1,2,4,5,6
8	Financial & Economic Analysis and Audit Report Preparation	1,2,3,5, 6

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV2360
Course Name: Sustainable and Green Transportation
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners

- To introduce the principles, challenges, and components of sustainable and green transportation systems.
- To develop understanding of energy use, emissions, and environmental impacts of various transportation modes.
- To equip students with analytical and planning tools for designing sustainable and efficient transportation solutions.
- To enable students to evaluate policies, technologies, and strategies that promote low-carbon and resilient mobility systems.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Sustainable Transportation** Definition, goals, pillars of sustainability (environmental, economic, social); Transportation's role in energy use and climate change; Global & Indian sustainability benchmarks (COP goals, National Urban Transport Policy); Overview of conventional vs sustainable systems.	04	10
2.	**Transportation System Components & Performance** Passenger & freight transport systems; Infrastructure components: roads, transit, NMT, rail, waterways; System performance metrics: speed, capacity, LOS, reliability, safety.	08	20
3.	**Sustainable Urban Transportation Planning** Transport planning process; Travel demand, land use–transport interaction; Transit-oriented development (TOD); Non-motorized transport (walking, cycling); BRT, metro, paratransit systems—case studies (e.g., Ahmedabad BRTS)	05	10

4.	**Energy, Emissions & Environmental Impacts** Vehicular energy consumption; Emissions: CO_2, NOx, PM, LCA of transport technologies; Air quality impacts; Noise impacts, ecological footprint; Tools for environmental assessment (emission models, LCA frameworks).	06	15
5.	**Sustainable Transport System Design** Roadway design & geometric considerations for sustainability; Complete streets design; Signal design & ITS for sustainability (adaptive signals, demand management); Public transport priority and multimodal integration.	05	10
6.	**Green Technologies & Low-Carbon Mobility** Electric vehicles (EVs), hybrids; Battery technology, charging infrastructure planning; Alternative fuels: biofuels, hydrogen, CNG; Shared mobility: ride sharing, e-bikes, e-rickshaws; Sustainable logistics, last-mile green delivery.	06	15
7.	**Transport Policy, Economics & Governance** Pricing mechanisms: congestion pricing, carbon pricing; Transport economics: cost-benefit for sustainable investments; Policy frameworks (India + global); Public participation & equity in transport policy; Road safety policy & Vision Zero concepts.	05	10
8.	**Future of Sustainable Transportation** Smart mobility systems: MaaS, autonomous vehicles, IoT; Data-driven mobility management (big data, GIS, sensors); Green ports & intermodal freight systems; Sustainable transport indicators and monitoring; Global case studies & future trends.	06	10
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1	Assessment of Transportation System Performance Using Field Data	01
2	Urban Street Design Audit for Sustainable and Complete Streets	02
3	Estimation of Vehicular Emissions Using Standard Emission Models	02
4	Travel Demand Analysis and Mode-Choice Evaluation	02
5	Non-Motorized Transport (NMT) Infrastructure Survey and Gap Assessment	02
6	Public Transport Accessibility Analysis Using GIS Tools	02
7	Energy and Life-Cycle Impact Comparison of Conventional vs Electric Vehicles	02
8	Sustainable Mobility Plan Preparation for a Selected Campus or Urban Area	02
	TOTAL	15

Text Book(s):

Title	Author/s	Publication
Sustainable Transportation Systems Engineering – 1st Edition	Francis Vanek, Largus Angenent, James H. Banks, Ricardo A. Daziano, Mark A.	McGraw-Hill Professional

Reference Book(s):itle	Author/s	Publication
An Introduction to Sustainable Transportation: Policy, Planning and Implementation	Preston L. Schiller & Jeffrey R. Kenworthy	Routledge, 2nd edition, 2017
Sustainable Transportation Planning: Tools for Creating Vibrant, Healthy, and Resilient Communities	Jeffrey Tumlin	Wiley, 2012
Green Transport: A Sustainable Approach	Paul Wrigley	NY Research Press, 2018

Web Material Link(s):

- https://nptel.ac.in/courses/105107210

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by course coordinator.
- End semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of tutorial which will be evaluated out of 10 for each tutorial and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

SECV2360	Sustainable and Green Transportation
CO 1	Analyze transportation system performance and identify sustainability challenges.
CO 2	Evaluate environmental impacts, energy consumption, and emissions of different transport modes.
CO 3	Design sustainable transportation solutions including NMT, public transport, and green mobility technologies.
CO 4	Apply planning tools, GIS techniques, and sustainability indicators to assess urban mobility systems.
CO 5	Recommend policy, technological, and design interventions for improving sustainability of transport systems.

Mapping of CO with PO

SECV2360	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11
CO 1	3	3	2	1	2			3		3	3

CO 2	1	1	3	3	3	2	3		3	3	1
CO 3	3	1	1	1	2	3	3	3		3	1
CO 4	2	1	3	3	3				3		3
CO 5	2	2	1	1		2	3	3		3	3

Mapping of CO with PSO

SECV2360	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	2	3	2
CO 3	2	2	3
CO 4	3	3	3
CO 5	2	3	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Sustainable Transportation	1, 2, 3
2	Transportation System Components & Performance	1, 2, 3,4
3	Sustainable Urban Transportation Planning	1, 2, 3, 4
4	Energy, Emissions & Environmental Impacts	1, 2, 3, 4, 5, 6
5	Sustainable Transport System Design	1, 2, 3, 4
6	Green Technologies & Low-Carbon Mobility	3,4,6
7	Transport Policy, Economics & Governance	1, 2, 3, 4
8	Future of Sustainable Transportation	3,4,6

P P Savani University

School of Engineering

Department of Science & Humanities

Course Code: SESH2120

Course Name: Numerical Method & Statistics

Prerequisite Course(s): SESH2110- Differential Methods and Complex Variable

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learner to

- provide the knowledge of numerical analysis & statistical methods to the students.
- mentally prepare the students to identify and formulate the engineering problem and obtain their solution.
- inculcate the analytical skill of the students to apply the Numerical & Statistical techniques to the problems of respective field.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Approximations and Errors:** Errors and Their computations, General error formula. **Solution of Algebraic and Transcendental Equations:** Bracketing Methods (Bisection, Secant, Method of False Position), Convergence of Iterative Methods, Newton-Raphson Method, Newton-Raphson Method	7	17
2.	**Numerical Solutions of Linear Equations** Gauss-Seidel Method Iteration Method, Jacobi's Method, Gauss-Seidel Method, Eigen Value Problem.	6	13
3.	**Numerical Differentiation and Integration** Finite Differences: Forward, Backward and Divided Differences Table, Newton's Forward, Backward and Divided Differences Interpolation Formula, Interpolation Polynomials, Lagrange Interpolation Formula Interpolation, Numerical Integration, Trapezoidal Rule, Simpson's 1/3-rule, Simpson's 3/8-rule.	10	20
Section II			
Module	Content	Hours	Weightage in %

1.	**Numerical Methods for ODEs**: Taylor's Series and Euler's Method, Modifications and Improvements in Euler's Method, Runge-Kutta 2nd Order & 4th Order Methods, Milne's Predictor-Corrector Methods, Boundary Value Problems.	7	16
2.	**Basics of Statistics** Elements, Variables, Observations, Quantitative and Qualitative data, Cross-sectional and Time series data, Frequency distribution, Dot plot, Histogram, Cumulative distribution, Measure of location, Mean, Median, Mode, Percentile, Quartile, Measure of variability, Range, Interquartile Range, Variance, Standard Deviation, Coefficient of Variation, Regression line and regression coefficient, Karl Pearson's method	7	16
3.	**Probability Distribution** Introduction, Conditional probability, Independent events, independent experiments, Bayes' theorem, Probability distribution, Binomial distribution, Poisson distribution, Normal distribution.	8	18

List of Tutorials:

Sr. No.	Name of Tutorial	Hours
1.	Approximations and Errors	2
2.	Solution of Algebraic and Transcendental Equations	4
3.	Numerical Solutions of Linear Equations	2
4.	Numerical Differentiation and Integration-1	2
5.	Numerical Differentiation and Integration-2	2
6.	Ordinary Differential Equations-1	2
7.	Ordinary Differential Equations-2	4
8.	Basics of Statistics-1	4
9.	Basics of Statistics-2	2
10.	Probability-1	4
11.	Probability-2	2

Text Book(s):

Title	Author/s	Publication
Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India Pvt. Ltd. New Delhi.
Probability and Statistics for Engineers	Richard A. Johnson Irwin Miller, John Freund	Pearson India Education Services Pvt. Ltd., Noida.

Reference Book(s):

Title	Author/s	Publication
Numerical Methods in Engineering & Science	B. S. Grewal	Khanna Publishers, New Delhi
Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyengar	Narosa Publishing House, New Delhi.
Introductory Methods of Numerical Analysis.	S. S. Sastry	PHI Learning Pvt. Ltd., New Delhi.

Statistics for Business and Economics	David R. Anderson, Dennis J. Sweeney, Thomas A.Williams	Cengage Learning

Web Material Link(s):

- http://nptel.ac.in/courses/111106094/
- http://nptel.ac.in/courses/111105035/
- http://nptel.ac.in/courses/111101003/
- http://nptel.ac.in/courses/111105090/
- http://nptel.ac.in/courses/111107105/
- http://nptel.ac.in/courses/110107114

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 50 marks.
- MCQ based examination consists of 20 marks.
- Internal Viva consists of 30 marks.

Course Outcome(s):

After completion of the course, the student will be able to

SESH2120	**NUMERICAL METHODS & STATISTICS**
CO 1	Derive numerical solution of linear and nonlinear system of equation.
CO 2	Acquire knowledge of finite differences, interpolation, numerical differentiation and numerical integration.
CO 3	Compare variety of numerical methods for solving ordinary differential Equation.
CO 4	Construct different statistical methods to collect, compare, interpret & evaluate data.
CO 5	Apply probability in decision making, artificial intelligence, machine learning etc.

Mapping of CO with PO

SESH2120	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	1	1								1
CO 2	2	1	1	2								1
CO 3	2	2	1	1								1
CO 4	2	1	1	1								1
CO 5												

Mapping of CO with PSO

SESH2120	PSO1	PSO2	PSO3
CO 1		2	
CO 2		2	
CO 3		2	

CO 4		2	
CO 5			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Solution of Algebraic and Transcendental Equations	1, 2, 3, 4, 6
2	Numerical Solutions of Linear Equations	1, 2, 3, 5
3	Numerical Differentiation and Integration	1, 2, 3, 5
4	Numerical Methods for ODEs	1, 2, 3, 5, 6
5	Basics of Statistics	1, 2, 3, 4, 5
6	Probability Distribution	1, 2, 3, 4, 5

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECT2520
Course Name: Sustainable Materials
Prerequisite Course/s:

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objectives of the Course:
To help learners to

- Understand principles of sustainable materials and circular economy.
- Analyze environmental impacts of construction materials.
- Evaluate alternative green and low-carbon materials.
- Apply life-cycle thinking in material selection.
- Promote resource efficiency and waste reduction in construction.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Sustainable Materials** Concept of sustainability in materials; Environmental impacts of construction materials; Carbon footprint; Embodied energy; Circular economy principles; Global and Indian sustainability initiatives.	04	10
2.	Life Cycle Assessment (LCA) of Materials Life-cycle stages (cradle-to-grave, cradle-to-cradle); LCA methodology; ISO 14040 framework; Embodied carbon calculation; Environmental Product Declarations (EPDs); Case studies.	06	15
3.	**Sustainable Cement and Concrete Technologies** Blended cements (PPC, PSC); Geopolymer concrete; Green concrete; Recycled aggregates; Supplementary cementitious materials (fly ash, GGBS, silica fume); Low-carbon mix design.	08	20
4.	**Sustainable Metals, Timber & Alternative Materials** Recycled steel and aluminum; Engineered wood (CLT, Glulam); Bamboo as construction material; Low-impact finishing materials; Durability and life-cycle performance.	06	15
5.	**Waste-Derived and Innovative Materials** Plastic waste in construction; Construction & demolition waste reuse; Industrial by-products utilization; Bio-based materials; 3D printed sustainable materials; Nanomaterials in sustainability.	06	15

6.	**Energy-Efficient & Thermal Performance Materials** Insulation materials (natural & synthetic); Cool roofs and reflective materials; Phase change materials (PCM); Smart materials; Thermal mass and energy efficiency.	06	10
7.	**Sustainable Material Selection & Green Rating Systems** Material credits in Leadership in Energy and Environmental Design, Indian Green Building Council, and Green Rating for Integrated Habitat Assessment; Material performance criteria; Cost-benefit analysis; Sustainable procurement strategies.	05	10
8.	**Case Studies & Future Trends in Sustainable Materials** Net-zero material concepts; Carbon-negative materials; Digital material passports; Policy and regulatory frameworks (India & Global); Industry case studies.	05	05
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1	Calculation of Embodied Energy & Carbon	04
2	LCA Basic Case Study	04
3	Green Concrete Mix Design Exercise	04
4	Sustainable Material Identification Survey	04
5	Thermal Performance Comparison of Materials	04
6	Waste Utilization Case Study	04
7	Green Rating Material Credit Evaluation	04
8	Sustainable Material Selection for a Building Project	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Sustainable Materials: With Both Eyes Open	Julian M. Allwood & Jonathan M. Cullen	UIT Cambridge

Reference Book(s):

Title	Author/s	Publication
Green Building Materials: A Guide to Product Selection	Ross Spiegel & Dru Meadows	Wiley
Materials for Sustainable Sites	Meg Calkins	Wiley

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical and noted the same in manual and record book which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva component of 20 marks.

- Practical performance/quiz/drawing/test of 30marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SECT2520	SUSTAINABLE MATERIAL
CO 1	Explain sustainability concepts related to construction materials.
CO 2	Analyze life-cycle impacts of materials using LCA principles.
CO 3	Compare traditional and sustainable materials based on environmental and economic performance.
CO 4	Apply sustainable material selection criteria in real projects.
CO 5	Propose innovative and low-carbon material solutions for construction.

Mapping of CO with PO

SECT2520	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	2		2		2		3		2	
CO 2	3	2	3	3	3		3		2	3	2
CO 3	2	3	3	2	2	3	3	3	2	3	3
CO 4	3	3		3	3	2	3	3	3		3
CO 5	3		3	3	3	3		2	2	3	3

Mapping of CO with PSO

SECT2520	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2	3	2
CO 3	3	3	3
CO 4	3	2	2
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Sustainable Materials	1, 2, 3, 4, 6
2	Life Cycle Assessment (LCA) of Materials	1, 2, 3, 5
3	Sustainable Cement and Concrete Technologies	1, 2, 3, 5
4	Sustainable Metals, Timber & Alternative Materials	1, 2, 3, 5
5	Waste-Derived and Innovative Materials	1, 2, 3, 5, 6
6	Energy-Efficient & Thermal Performance Materials	1, 2, 3, 4, 5
7	Sustainable Material Selection & Green Rating Systems	1, 2, 3, 4, 5
8	Case Studies & Future Trends in Sustainable Materials	1, 2, 3, 4, 5

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV2350
Course Name: Geology & Geotechnical Engineering
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective of the Course:
To help learners to

- understand the properties and behaviour of soil for the design of structures.
- introduce students with basic principles of geosciences and their applications in Civil Engineering.

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Physical Geology** Scope of geology in civil engineering, Branches of geology, Weathering, Landform and Process associated with ground water, Causes & Classification of earthquake.	03	10
2.	**Mineralogy & Rock Classification** Physical properties of minerals, Monoclinic system, Quartz group, Felspar group, Pyroxenes group, Amphibole group, Hornblende: (compound-complex silicate), Mica group, Igneous rocks, Textures of igneous rocks, Forms of igneous rocks, Important igneous rocks, briefly explain about sedimentary rocks, Important sedimentary rocks, lime stones, metamorphic rocks, Classification of metamorphic rocks	06	20
3.	**Structural Geology and Geophysical Methods** Outcrop, Folds arts of a fold, Classification of folds, Causes of folding, fault & faulting, Joints and jointing.	03	10
4.	**Introduction of Soil and Soil Mechanics** Definition, Development of soil mechanics, Soil formation, Residual and transported soils, Some commonly used soil designations, Structure and texture of soils, Soil as construction material, Limitations of soil mechanics.	05	10

5.	**Composition of Soil Terminology, Index Properties and Relationships** Composition of soil, Phase diagram, Basic terms and definitions, Water content, Soil Relative density, Functional relationships, Determination of index properties, Relative density for granular soil, Consistency limits and its determination, different indices, Field moisture equivalent, Activity, Sensitivity & Thixotropy of soil.	06	06
6.	**Soil Classification & Particle Size Analysis** Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil, Size and nomenclature of soil particles as per IS, Sieve analysis, Sedimentation analysis, Particle size distribution curve and its uses.	10	16
7.	**Soil Moisture** Water type, Effect of moisture content on soil, Ground water, Hydroscopic moisture, Capillary water, Apparent cohesion, Natural and effective pressure, Seepage velocity. **Capillary:** Capillary rise in soil, Introduction of seepage and flow net. **Permeability:** Permeability derivation and definition, Laboratory Permeability, Field permeability, Permeability of layered soil.	08	18
8.	**Soil Sub-Surface Investigations** Planning soil exploration, Methods of exploration, Soil borings, sounding, Sampling, Spacing and depth of borings, Stand and penetration test, Record of field investigation.	04	10
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Moisture Content	02
2.	Visual identification and specific gravity	02
3.	Soil Classification by Sieve Analysis	02
4.	Liquid and Plastic Limit Test	04
5.	Shrinkage limit Test	02
6.	In-situ Density-Core Cutter & Sand Replacement method	04
7.	Permeability Test: Constant and Variable Head	04
8.	Study of rock specimen	04
9.	Study of Strike and dip using models	04
10.	Geology Lab visit	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Soil Mechanics & Foundation	Dr. B. C. Punmia	Laxmi Publication

Reference Book(s):

Title	Author/s	Publication
Soil Mechanics and Foundation Engineering	V. N. S. Murthy	Dhanpatrai Engineering
Laboratory Testing for Soils, Rocks and Aggregates.	Sivakugan, Arulrajah	J. Ross Publishing
Engineering Geology for Civil Engineers	P. C. Varghese	PHI Learning Pvt. Ltd
Geotechnical Engineering (Soil Mechanics)	T.G. Sitharam & T.N. Ramamurthy	S. Chand
Geotechnical Engineering	C. Venkatramaiah	Universities Press
Geotechnical Engineering	Manoj Datta, Shashi K Gulhati	Tata MacGrawHill
Laboratory Testing for Soils, Rocks and Aggregates.	Sivakugan, Arulrajah, Bo	J. Ross Publishing

Web Material Links:

- https://www.vidyarthiplus.com/vp/thread-36461.html#.WjzMdt-WY2w
- http://www.soest.hawaii.edu/martel/Courses/GG454/index.html
- https://web.viu.ca/earle/geol111/lecture-notes.htm
- http://nptel.ac.in/downloads/105101001/
- http://www.vssut.ac.in/lecture_notes/lecture1428371514.pdf
- http://www.vssut.ac.in/lecture-notes.php?url=civil-engineering
- https://drshahpak.weebly.com/uploads/5/6/3/3/5633102/intro.pdf

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical

- Continuous Evaluation consists of performance of practical/tutorial which should be evaluated out of 10 for each practical/tutorial and average of the same will be converted to 20 marks.
- Internal viva component of 20 marks.
- Practical performance/quiz/test/assignment of 30 marks during end semester exam.
- Viva/Oral performance of 30 marks during end semester exam.

Course Outcome(s):

After completion of the course, the student will be able to

SECV2350	GEOLOGY & GEOTECHNICAL ENGINEERING
CO 1	Understand fundamental concepts of geology and its relevance in civil engineering projects, including earth processes, landforms, earthquakes, and weathering.
CO 2	Identify and classify minerals and rocks based on physical properties, texture, formation, and composition, and apply this knowledge to select appropriate construction materials.
CO 3	Analyze structural geology features such as folds, faults, and joints, and interpret geophysical methods for understanding subsurface conditions relevant to civil engineering projects
CO 4	Characterize soils and determine their properties, including index properties,

	classification, moisture content, relative density, and permeability, to assess their suitability for construction.
CO 5	Plan and perform soil exploration and subsurface investigations using methods like borings, sampling, sounding, and field tests, to provide data for design and construction of foundations and other civil engineering structures.

Mapping of CO with PO

SECV2350	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3			3			3		2	2	3
CO 2	3	3	2	2	3		2	3		3	3
CO 3	3		3	3	2	3	3		3	3	
CO 4	2	3	2	3	2	3		2		3	2
CO 5		3	3	2	3		3	3	3		3

Mapping of CO with PSO

SECV2350	PSO1	PSO2	PSO3
CO 1	3	1	2
CO 2	3	3	3
CO 3	2	1	2
CO 4	2	2	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to physical geology	1, 2, 3,4
2	Mineralogy & Rock Classification	1, 2, 3,4
3	Structural Geology and Geophysical Methods	1, 2, 3,4
4	Introduction of Soil and Soil Mechanics	1, 2, 3,4
5	Composition of Soil Terminology, Index Properties and Relationships	1,2
6	Soil Classification & Particle Size Analysis	1,2, 3, 4,5
7	Soil Moisture	1,2, 3, 4,5
8	Soil Sub-Surface Investigations	1,2, 3, 4,5

P P Savani University
School of Engineering
Department of Civil Engineering

Course Code: SECT2530
Course Name: Urban Sustainability
Prerequisite Course/s:

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objectives of the Course:
To help learners to

- Understand principles of sustainable urban development.
- Analyze environmental, social, and economic dimensions of cities.
- Evaluate urban infrastructure systems for sustainability.
- Apply planning tools for resilient and smart cities.
- Develop integrated solutions for sustainable urban growth.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction to Urban Sustainability** Concept of sustainable development; Urbanization trends (India & Global); Challenges of rapid urban growth; Sustainability pillars (environmental, economic, social); UN Sustainable Development Goals (SDGs); Climate change and cities.	04	10
2.	**Sustainable Urban Planning & Land Use** Urban planning principles; Compact city concept; Mixed land use; Transit-Oriented Development (TOD); Zoning regulations; Urban sprawl; Smart growth strategies; Master planning fundamentals.	06	15
3.	**Sustainable Urban Infrastructure Systems** Water supply & wastewater management; Urban drainage & stormwater management; Solid waste management; Energy-efficient urban utilities; Green infrastructure (urban forests, wetlands).	08	20

4.	**Sustainable Transportation & Mobility** Public transport systems; Non-motorized transport (NMT); Electric mobility; Shared mobility; Urban congestion management; Low-carbon transport strategies; Case studies (e.g., BRT, Metro systems).	06	15
5.	**Urban Energy & Climate Resilience** Urban energy demand; Renewable integration in cities; Net-zero neighborhoods; Urban heat island effect; Climate adaptation strategies; Disaster-resilient urban design; Carbon-neutral cities.	05	10
6.	**Sustainable Housing & Green Buildings** Affordable and sustainable housing; Eco-friendly construction materials; Green building rating systems such as Leadership in Energy and Environmental Design, Indian Green Building Council, and Green Rating for Integrated Habitat Assessment; Energy-efficient residential planning; Urban regeneration & redevelopment.	05	10
7.	**Urban Governance, Policy & Economics** Urban governance models; Municipal finance; Public-private partnerships (PPP); Urban sustainability indicators; National initiatives like Smart Cities Mission (India); Policy frameworks for sustainable cities.	05	10
8.	**Smart Cities & Future Urban Innovations** Smart city concepts; ICT in urban management; GIS-based urban planning; IoT in city infrastructure; Data-driven urban management; Future trends in sustainable cities; Global case studies.	06	10
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1	Urban Sustainability Indicators Calculation	04
2	Land Use Planning Exercise	02
3	Urban Infrastructure Assessment	04
4	Sustainable Mobility Plan Preparation	04
5	Climate Resilience Case Study	04
6	Green Building Evaluation (Urban Context)	04
7	Smart City Data Analysis Exercise	04
8	Sustainable Urban Development Project Report	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Sustainable Urbanism	Douglas Farr	Wiley

Reference Book(s):

Title	Author/s	Publication
Sustainable Cities and Communities	Woodrow W. Clark	Springer
Sustainable Urban Development Reader	Stephen M. Wheeler & Timothy Beatley	Routledge

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical and noted the same in manual and record book which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva component of 20 marks.
- Practical performance/quiz/drawing/test of 30marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SECT2520	SURVEYING & LEVELLING
CO 1	Explain principles of urban sustainability and sustainable development goals.
CO 2	Analyze urban infrastructure systems for environmental and resource efficiency.
CO 3	Design sustainable mobility and land-use strategies.
CO 4	Evaluate urban sustainability using indicators and rating tools.
CO 5	Propose integrated and innovative solutions for sustainable urban growth.

Mapping of CO with PO

SECT2520	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	2		2		2		3		2	
CO 2	3	2	3				3		2	3	2
CO 3	2	3	3	2	2		3	3			3
CO 4	3	3	3	3	3	2	3	3	3		3
CO 5	3		3	3	3	3		2	2	3	3

Mapping of CO with PSO

SECT2520	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2	3	
CO 3	3	3	3
CO 4			2
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Urban Sustainability	1, 2, 3, 4, 6
2	Sustainable Urban Planning & Land Use	1, 2, 3, 5
3	Sustainable Urban Infrastructure Systems	1, 2, 3, 5
4	Sustainable Transportation & Mobility	1, 2, 3, 5
5	Urban Energy & Climate Resilience	1, 2, 3, 5, 6
6	Sustainable Housing & Green Buildings	1, 2, 3, 4, 5
7	Urban Governance, Policy & Economics	1, 2, 3, 4, 5
8	Smart Cities & Future Urban Innovations	1, 2, 3, 4, 5

P P Savani University
School of Engineering
Department of Civil Engineering

Course Code: SECV2370
Course Name: Surveying & Levelling
Prerequisite Course/s: Elements of Civil Engineering (SECV1020)

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objectives of the Course:
To help learners to
- understand the engineering approach about surveying.
- understand process of measuring the direct and in direct measurement.
- carry out simple land survey process and area computation.
- understand components of instruments, terminology and applications.

Course Content:

Module No.	Content	Hours	Weightage in %
1.	**Introduction** Introduction, Compass Surveying, Dumpy level, Chain Surveying, Tape, Benchmark, working principle, precise plane table equipment, Temporary adjustments, setting up the plane table, methods of plane tabling, advantages, sources of errors.	09	10
2.	**Theodolite Traversing** Introduction, Classification, Definitions, Essentials of theodolite, Temporary and Permanent adjustment of theodolite, Measurement methods of horizontal and vertical angles, lines and relation, Sources of errors, methods of traversing, closing error, computation of traverse, check in closed and open traverse, balancing of traverse, Gale's table, traverse area, omitted measurements, Errors.	08	18
3.	**Trigonometric Surveying** Introduction, Different cases for determine height and elevation, Errors.	02	14
4.	**Contour Surveying** Horizontal and vertical control networks: uses, methods of establishing control points Error analysis: checking, adjusting control networks, omitted	04	07

	measurement corrections, least squares (basic idea).		
5.	**Setting Out Works:** Building	03	04
6.	**Tacheometry Survey** Introduction, Instruments used, Methods of tacheometry measurement, Distance and elevation measurement for fixed hair, movable hair and tangential method, Use of Analytic lens, Substance bar, Errors.	07	14
7.	**Curve Setting** Introduction, Classification, Definitions, Simple circular curve: Elements, Designation, Setting out methods, Elements of compound curve, Reverse curve and its elements, Transit curve: super elevation, length, ideal transit curve, Errors.	07	23
8.	**Computation of Area and Volume** Introduction, Methods of computing area: from plan, from offset, from coordinate, By planimeter, Volume from cross sections, Trapezoidal and Prismoidsal formulae, Prismoidal correction, Curvature correction, capacity of reservoir, Errors. Features of Total Station	05	10
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1	Locating the given building point by plane table using method of radiation.	02
2	Plane Table Traversing	04
3	Chain & Compass Survey	04
4	Measurement of horizontal angle using theodolite by method of repetition.	02
5	Measurement of horizontal angle using theodolite by method of reiteration.	02
6	Measurement of vertical angle using theodolite.	02
7	Determination of multiplying and additive constants of a Tacheometer	02
8	Determination of horizontal and vertical distance with tacheometery.	04
9	Setting out simple circular curve using Rankine's Deflection angle method	02
10	Dumpy level	04
11	Introduction of Total Station	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Surveying Volume I & II	Dr. B.C. Punamia, Dr. Ashok K. Jain	Laxmi Publication

Reference Book(s):

Title	Author/s	Publication
Surveying Volume I & II	S.K. Duggal	McGraw Hill
Surveying and Leveling	N. N. Basak	Tata McGraw Hill

Surveying and Leveling	R. Subramanian	Oxford University
Surveying Volume I and II	K.R. Arora	Standard Book House
Surveying and Leveling, Advance	R. Agor	Khanna

Web Material Link(s):

- http://nptel.ac.in/courses/105107122/2
- http://nptel.ac.in/courses/105104101/1
- http://nptel.ac.in/courses/105104101/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical and noted the same in manual and record book which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva component of 20 marks.
- Practical performance/quiz/drawing/test of 30marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

SECV2370	**SURVEYING & LEVELLING**
CO 1	Understand and apply fundamental concepts and instruments of surveying including compass, chain, tape, dumpy level, and plane table, to perform basic field surveys accurately.
CO 2	Perform theodolite traversing and trigonometric surveying to determine horizontal and vertical angles, elevations, and heights, while minimizing errors in measurement and computation.
CO 3	Establish control networks through triangulation and trilateration, and analyze errors to adjust and validate survey data for large-scale civil engineering projects.
CO 4	Set out civil engineering works such as buildings, bridges, culverts, tunnels, and curves in the field using surveying techniques and ensure design specifications are accurately implemented.
CO 5	Compute areas and volumes for land and earthwork, using traditional methods) and modern instruments and apply tacheometric methods for precise distance and elevation measurement.

Mapping of CO with PO

SECV2370	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11
CO 1	3	2		2		2		3		2	
CO 2	3	2	3	3	3		3		2	3	2
CO 3	2	3	3	2	2	3	3	3	2	3	3
CO 4	3	3		3	3	2	3	3	3		3
CO 5	3		3	3	3	3		2	2	3	3

Mapping of CO with PSO

SECV2370	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2	3	2
CO 3	3	3	3
CO 4	3	2	2
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction	1, 2, 3, 4, 6
2	Theodolite Traversing	1, 2, 3, 5
3	Trigonometric Surveying	1, 2, 3, 5
4	Control Surveying, Triangulation & Trilateration	1, 2, 3, 5
5	Setting Out Works	1, 2, 3, 5, 6
6	Tacheometry Surveying	1, 2, 3, 4, 5
7	Curve Surveying	1, 2, 3, 4, 5
8	Computation of Area and Volume	1, 2, 3, 4, 5