



**PPSU**

**P P SAVANI UNIVERSITY**

**SCHOOL OF ENGINEERING**

**B. TECH. (MECHANICAL 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 EDUCATIONAL 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 these broadest context of technological change.

<b>PSO No</b>	<b>PROGRAMME SPECIFIC OUTCOMES (PSO)</b> <b>MECHANICAL ENGINEERING</b>
PSO 1	Analyse, interpret and provide solutions to real life Mechanical Engineering problems.
PSO 2	Develop an attitude to accept global challenges and apply Mechanical Engineering knowledge for solving problems related to design, production, thermal and interdisciplinary fields.
PSO 3	Attain excellence in using managerial tools and techniques for effective and efficient manufacturing and in developing research & leadership skills with ethical and environmental practices.

<b>Credit Guidelines (General)</b>			
<b>Component</b>	<b>Hour/Week</b>	<b>Credit</b>	<b>Total Hours/Semester</b>
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.

<b>CO-PO Mapping Guidelines</b>		
<b>Mapping Level</b>	<b>% age Mapping</b>	<b>Indicator</b>
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. (Mechanical Engineering)

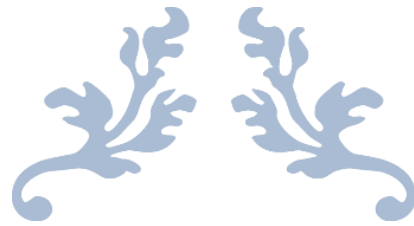


**P P Savani University**  
School of Engineering

Effective From: 2025-26  
Authored by: P P Savani University

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# FIRST YEAR B. TECH.

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P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

TEACHING & EXAMINATION SCHEME FOR FIRST YEAR B.TECH. MECHANICAL 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	IT	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	100	0	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	00	0	0	100
	SECE1220	Digital Proficiency	CE	3	0	0	3	3	40	60	0	0	0	0	100
				<b>Total</b>	<b>48</b>	<b>44</b>								<b>1900</b>	

<b>Group 1</b>	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	IT	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	100	0	0	0	0	0	100
							<b>Total</b>	<b>23</b>	<b>21</b>						
<b>Group 2</b>	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	00	0	0	100
	SECE1220	Digital Proficiency	CE	3	0	0	3	3	40	60	0	0	0	0	100
							<b>Total</b>	<b>25</b>	<b>23</b>						

**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 12<sup>th</sup> 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.	<b>Calculus</b> Limits, Continuity, Types of Discontinuity, Successive Differentiation, Rolle's Theorem, LMVT, CMVT, Maxima and Minima.	09	20
2.	<b>Sequence and Series-I</b> Convergence and Divergence, Comparison Test, Integral Test, Ratio Test, Root Test, Alternating Series, Absolute and Conditional Convergence.	09	20
3.	<b>Sequence and Series-II</b> Power series, Taylor and Maclaurin series, Indeterminate forms and L'Hospital's Rule.	05	10
4.	<b>Partial Derivatives</b> Function of several variables, Partial differentiation, Applications, Chain rule, Linear approximations, Maxima and Minima, Euler's theorem, Lagrange multiplier.	11	30
5.	<b>Curve tracing</b> Tracing of Cartesian Curves, Polar Coordinates, Polar and Parametric Form of Standard Curves, Areas and Length in Polar co-ordinates	11	20
	<b>TOTAL</b>	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
<b>TOTAL</b>		<b>30</b>

**Text Book:**

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

<b>SESH1110</b>	<b>CALCULUS</b>
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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	1	1	3
CO 2	2	3	2
CO 3	2	2	2
CO 4	1	1	
CO 5	1	3	1

#### 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.	<b>Introduction to Boiler:</b> Introduction, Fundamental Principles, Classification	07	15
2.	<b>Classification of Engineering Materials:</b> 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.	<b>Fluids:</b> 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.	<b>Measurement:</b> 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.	<b>Basic Concepts of Thermodynamics:</b> Prime Movers - Meaning and Classification; the Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific Heat Capacity, Internal Energy, Specific Volume; Thermodynamic Systems, All Laws of Thermodynamics	04	09
7.	<b>Basics of I.C Engines:</b> 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.	<b>Power Transmission Elements:</b> Construction and Applications of Couplings, Clutches and Brakes, Difference Between Clutch and Coupling, Types of Belt Drive and Gear Drive	06	18
	<b>TOTAL</b>	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
	<b>TOTAL</b>	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	2	2
CO 2	2	2	2
CO 3	3	2	2
CO 4	3	2	2
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	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 Computer 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.	<b>Introduction to Python</b> 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.	<b>Decision Structures in Python</b> 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.	<b>Array and Strings in Python</b> Arrays, Basic Strings, Accessing Strings, Basic Operations, String Slicing, Testing, Searching and Manipulating Strings, Function and Methods.	03	08
4.	<b>Dictionary, List, Tuples and Sets</b> 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.	<b>Functions, Modules and Packages in Python</b> 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
6.	<b>Python Object Oriented Programming</b> 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:	08	16

	Creating Python Classes, Modules and Packages, Inheritance in Python, Polymorphism in Python.		
7.	<b>Files &amp; Regular Expression in Python</b> 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.	<b>Exception Handling in Python</b> 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.	<b>Building Desktop Application</b> Exploring the Tkinter Library in Python, Creating basic Desktop application using Tkinter	04	14
<b>TOTAL</b>		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
<b>TOTAL</b>		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](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	PO7	PO8	PO9	PO10	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	1
CO 2	2	1	2
CO 3	2	3	3
CO 4	3	3	3
CO 5	2	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 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)			Credit	Examination Scheme (Marks)						
Theory	Practical	Tutorial		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	<b>QUANTUM PHYSICS</b> (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	<b>Acoustic and Ultrasonic</b> (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	<b>LASER AND FIBRE OPTICS</b> (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	<b>NANOSCIENCE AND NANOTECHNOLOGY</b> (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	<b>SUPERCONDUCTORS</b> (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 T <sub>c</sub> superconductors, Applications: Magnets, Josephson effect, SQUID, Maglev, other.	07	18
6	<b>SEMICONDUCTORS</b> (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 Semiconductor Devices, Transistors (working and characteristics)	09	18
	<b>TOTAL</b>	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

	<b>TOTAL</b>	30
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**Text Book(s):**

<b>Title</b>	<b>Author/s</b>	<b>Publication</b>
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:

<b>SESH1130</b>	<b>EXPERIMENTAL PHYSICS</b>
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	0	0	0	0	1	2
CO 2	2	3	2	3	2	1	1	0	1	1	2
CO 3	2	2	2	2	2	0	1	0	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	0	1	1	2

#### Mapping of CO with PSO

SESH1130	PSO1	PSO2	PSO3
CO 1	2	2	
CO 2	1	1	1
CO 3		2	2
CO 4	2	1	3
CO 5	1		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	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 12<sup>th</sup> 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	<b>Matrix Algebra</b> 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	<b>Vector Space</b> 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	<b>Linear Transformation</b> Introduction of Linear Transformation, Kernel and Range, Rank and Nullity, Inverse of Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps.	09	20
4	<b>Inner Product Space</b> Inner Product, Angle and Orthogonality, Orthogonal projection, Gram-Schmidt process and QR Decomposition, least square decomposition.	08	20
5	<b>Beta and Gamma function</b> Improper Integrals, Convergence, Properties of Beta and Gamma Function, Duplication Formula (without proof)	05	10
<b>TOTAL</b>		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
	<b>TOTAL</b>	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 Chris 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 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 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.
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#### Mapping of CO with PO

SESH1120	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011
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	3	2	1
CO 2	1	1	
CO 3	2	2	2
CO 4	2	2	
CO 5	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	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.	<b>CIVIL ENGINEERING: AN OVERVIEW</b> Introduction, Branches, Scope, Impact, Role of Civil Engineer, Unit of measurement, Unit conversion (Length, Area, Volume).	04	10
2.	<b>INTRODUCTION TO CIVIL ENGINEERING MATERIALS:</b> 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.	<b>BUILDING CONSTRUCTION:</b> 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.	<b>INTRODUCTION TO TOWN PLANNING:</b> 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.	<b>INTRODUCTION TO SURVEYING AND LEVELLING:</b> 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.	10	20

	Modern tools: Introduction to theodolite, Total Station, GPS.		
6.	<b>CONSTRUCTION EQUIPMENT:</b> 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.	04	10
7.	<b>RECENT TRENDS IN CIVIL ENGINEERING:</b> Mass Transportation, Rapid Transportation, Smart City, Sky scarpers, 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.	Videoshowing working of construction Equipments.	04
10.	Presentation on various topics as in module 7 about recent trends.	04
	<b>TOTAL</b>	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	
CO 2	2	2	2
CO 3	3		2
CO 4		2	
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	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
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**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.	<b>Introduction to Computers Programming:</b> Introduction to programs, its significance, classification of programming language, Selection of a programming language, Flow Charts and Algorithms.	04	10
2.	<b>Introduction to Constants, Variables and Data Types:</b> 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.	<b>Operators, Expressions, and Managing I/O Operations:</b> Introduction to Operators and its Types, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity. Introduction to Reading a Character, Writing a Character, Formatted Input and Output.	05	10
4.	<b>Conditional Statements:</b> 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.	<b>Arrays:</b> Introduction, One-dimensional Arrays, Two-dimensional Arrays, Concept of Multidimensional Arrays.	06	15
6.	<b>Strings:</b> Declaring and Initializing String Variables, Arithmetic Operations on Characters, Putting Strings Together, Comparison of Two Strings, String Handling Functions.	05	12

7.	<b>User-Defined Functions:</b> Concepts of User-defined Functions, Prototypes, function Definition, Parameters, Parameter Passing, Calling a Function, Recursive Function.	06	13
8.	<b>Pointers:</b> 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
<b>TOTAL</b>		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
<b>TOTAL</b>		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=3QiltmIWmOM>

**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	PO7	PO8	PO9	PO10	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	3		3
CO 2	2	2	2
CO 3	1	2	
CO 4	2	1	
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 Science and Humanities**

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	<b>Basic Introduction to Electricity and Magnetism</b> 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	<b>DC Circuits and Electromagnetism</b> 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	<b>AC Circuits</b> 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	<b>Electronics</b> 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	11	25

	Devices.		
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#### 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
	<b>Total</b>	<b>30</b>

#### Text Book(s):

Title	Author/s	Publication
Basic electrical engineering	T.N. Nagsarkar and M.S. Sukhija	Oxford University Press, 3 <sup>rd</sup> 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, 7 <sup>th</sup> edition.
Electronic Devices and Circuits	David A. Bell	Oxford University Press, 5 <sup>th</sup> 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

<b>SEEC1210</b>	<b>BASICS OF ELECTRICAL AND ELECTRONICS</b>
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**

<b>SEEC1210</b>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	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**

<b>SEEC1210</b>	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	2	3
CO 3	3	1	3
CO 4	2	1	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

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
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
<b>TOTAL</b>		<b>30</b>

**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	2	3	2
CO 2			
CO 3	2	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

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.	<b>Introduction to Digital Literacy</b> 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.	<b>Office Productivity Tools</b> Word Processing: Document formatting, templates, and styles (MS Word/Google Docs). Presentation Tools: Slide design, animations (MS PowerPoint/Google Slides).	04	10
3.	<b>Data Handling and Analysis</b> 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.	<b>Computational Problem-Solving</b> Introduction to algorithms and flowcharts. Solving simple engineering problems through programming. Applications of computational techniques in various engineering domains.	06	12
5.	<b>Cybersecurity and Ethical Practices</b> 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.	<b>Introduction to AI Tools and Applications</b> 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.	<b>Emerging Technologies and Industry Trends</b> 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.	07	15
8.	<b>Capstone Project and Case Study</b> 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
<b>TOTAL</b>		45	100

#### Text Book(s):

Title	Author/s	Publication
Digital Literacy for Dummies	Faith 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=PLIKpQrBME6xLGL3Ty\\_1Wbd3nTZ\\_q\\_OKFQ](https://www.youtube.com/playlist?list=PLIKpQrBME6xLGL3Ty_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.
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### Mapping of CO with PO

SECE1220	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011
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

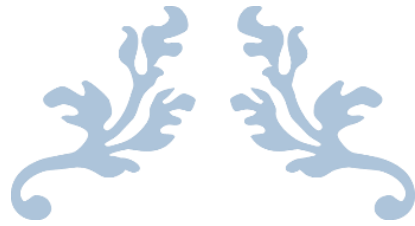
### Mapping of CO with PSO

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



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# SECOND YEAR B. TECH.

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**P P SAVANI UNIVERSITY**

**SCHOOL OF ENGINEERING**

**TEACHING & EXAMINATION SCHEME FOR B. TECH. MECHANICAL 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	ES E	CE	ESE	CE	ESE	
3	SESH2210	Complex Analysis & Differential Equations	SH	3	0	1	4	4	40	60	0	0	100	0	200
	SEME2301	Engineering Thermodynamics	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME2311	Material Science & Metallurgy	ME	3	2	0	5	4	40	60	40	60	0	0	200
	SEME2321	Manufacturing Technology-I	ME	3	2	0	5	4	40	60	40	60	0	0	200
	SECV2310	Mechanics of Solids	CV	3	2	0	5	4	40	60	40	60	0	0	200
	CFLS2140	Upper Intermediate Communicative English	CFLS	2	0	0	2	2	100	0	0	0	0	0	100
	CLSC2020	IPDC-I	CLSC	2	0	0	2	2	100	0	0	0	0	0	100
				<b>Total</b>				<b>27</b>	<b>23</b>						<b>1100</b>
4	SESH2220	Numerical Analysis & Applied Statistics	SH	3	0	2	5	5	40	60	0	0	100	0	200
	SEME2350	Fluid Mechanics	ME	3	2	0	5	4	40	60	40	60	0	0	200
	SEME2360	Mechanical Measurement & Metrology	ME	3	2	0	5	4	40	60	40	60	0	0	200
	SEME2370	Machine Drawing	ME	0	4	0	4	2	0	0	40	60	0	0	100
	SEME2380	Theory of Machines	ME	3	0	2	5	5	40	60	0	0	40	60	200
	CLSC2030	IPDC-II	CLSC	2	0	0	2	2	100	0	0	0	0	0	100
				<b>Total</b>				<b>26</b>	<b>22</b>						<b>1000</b>

**P P Savani University**  
**School of Engineering**

**Department of Science & Humanities**

Course Code: SESH2210

Course Name: Complex Analysis & Differential Equations

Prerequisite Course(s): --SESH1110- Calculus

**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	--	01	04	40	60	--	--	100	--	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

learn orientation of calculus and its applications in solving engineering problems including differential equations.

- learn introduction of Partial Differential Equations with methods of its solutions.
- learn applications of Laplace Transforms for solving ODEs.
- learn introduction of Periodic functions and Fourier series with their applications for solving ODEs.
- Represent complex numbers algebraically and geometrically.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Ordinary Differential Equation</b> First order ODEs, Formation of differential equations, Exact, linear and Bernoulli's equations, Ordinary differential equations of higher orders	05	07
2.	<b>Higher Order Ordinary Differential Equation</b> Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler-Cauchy Equations Differential Operators Nonhomogeneous ODEs, Variation of Parameters.	06	13
3.	<b>Partial Differential Equation</b> Formation of First and Second order equations, Solution of First order Linear and Non-linear equations	03	10
4.	<b>Higher order equations with constant coefficients</b> Higher order equations with constant coefficients, Complementary function, Particular Integrals, Initial and boundary conditions	06	12
5.	<b>Laplace Transform</b> Laplace Transform, Linearity, First Shifting Theorem, Existence Theorem, Transforms of Derivatives and Integrals, Unit Step Function, Second Shifting Theorem, Laplace Transformation of Periodic function, Inverse Laplace transform, Convolution, Systems of ODEs	07	14
6.	<b>Fourier Series</b> Fourier Series of $2n$ periodic functions, Euler Formula, Arbitrary Period, Even and Odd function, Half-Range Expansions.	06	13

7.	<b>Complex Variables</b> Complex Variable – Differentiation, Complex number, polar form of complex number, Cauchy-Riemann equations, analytic functions, harmonic functions, Mobius transformations and their properties.	07	16
8.	<b>Complex Variable - Integration</b> Representation by Fourier Integral, Cauchy's integral theorem and formula, Taylor and Laurent series.	05	15
	<b>TOTAL</b>	45	100

**List of Tutorial(s):**

Sr. No.	Name of Practical	Hours
1.	Ordinary Differential Equation-	02
2.	Higher Order Ordinary Differential Equation	04
3.	Partial Differential Equation	02
4.	Higher order equations with constant coefficients	04
5.	Laplace Transform-1	02
6.	Laplace Transform-2	04
7.	Fourier Series-1	04
8.	Fourier Series-2	02
9.	Complex Variables -1	02
10.	Complex Variables -2	04
	<b>TOTAL</b>	30

**Text Book(s):**

Title	Author/s	Publication
Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India Pvt. Ltd. New Delhi.

**Reference Book(s):**

Title	Author(s)	Publication
Higher Engineering Mathematics	B. S. Grewal Khanna Publishers	Khanna Publishers
Higher Engineering Mathematics	H.K. Dass, Er. Rajnish	

**Web Material Link(s):**

- <http://nptel.ac.in/courses/111105035/>
- <http://nptel.ac.in/courses/111106100/>
- <http://nptel.ac.in/courses/111105093/>
- <http://nptel.ac.in/courses/111108081/>
- <http://nptel.ac.in/courses/111/103/111103070/>

**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 the performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 100 marks.

**Course Outcome(s):**

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

<b>SESH2210</b>	<b>DIFFERENTIAL METHODS &amp; COMPLEX VARIABLE</b>
CO 1	Describe 1st and 2nd order odes and pde's.
CO 2	Classify differential equations and evaluate linear and nonlinear partial differential equation
CO 3	Apply Laplace transform as a tool which are used to evaluate differential equation.
CO 4	Examine the various tests of power series and Fourier series for learning engineering.
CO 5	Demonstrate understanding of the basic concepts underlying complex analysis to evaluate definite integrals and infinite series.

**Mapping of CO with PO**

<b>SESH2210</b>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	1	1							1
CO 2	1	1	1								1
CO 3	2	1	1	1							1
CO 4	2	1	1								1
CO 5	2	2	1	1							1

**Mapping of CO with PSO**

<b>SESH2210</b>	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	1	1	
CO 3	1	1	
CO 4	2		
CO 5	2	1	

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

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

<b>Module</b>	<b>Content</b>	<b>RBT Level</b>
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No		
1.	Ordinary Differential Equation-I	1, 2, 3, 5
2.	Ordinary Differential Equation-II	1, 2, 3, 5
3.	Partial Differential Equation-I	1, 2, 4, 5
4.	Partial Differential Equation-II	1, 2, 4, 5
5.	Laplace Transform	1, 2, 4, 5
6.	Fourier Series	1, 2, 3, 5
7.	Complex Variables	1, 2, 3, 4, 5
8.	Complex Integration	1, 2, 3, 4, 5

**P P Savani University**  
**School of Engineering**

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**Department of Mechanical Engineering**

Course Code: SEME2301

Course Name: Engineering Thermodynamics

Prerequisite Course(s): SEME1030-Elements of Mechanical Engineering

**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	-	-	03	40	60	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- identify different aspects of thermodynamics and their application.
- interpret different laws of thermodynamics and their application to field and daily life.
- understand various gas laws and equations of state and their application.
- understand the role of entropy, exergy to the universe.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Basic Concepts of Thermodynamic</b> Classical and statistical thermodynamic approach, Thermodynamic: system, properties, states, processes, cycle & equilibrium, Concepts of: control volume and control surface, Specific heat capacity, Internal Energy, Enthalpy, Specific Volume, heat and work.	05	07
2.	<b>First and Second law of Thermodynamics</b> First law for a closed system undergoing a cycle and change of state, energy, PMM1, First law of thermodynamics for a non- flow and flow process. Limitations of first law of thermodynamics, Statements of second law of thermodynamics and their equivalence, PMM2, Carnot's theorem, Corollary of Carnot's theorem, Causes of irreversibility.	08	20

3.	<b>Entropy</b> Clausius theorem, property of entropy, Clausius inequality, entropy change in an irreversible process, principle of increase of entropy, entropy change for non-flow and flow processes, third law of thermodynamics, PPM3, Entropy change for phase changing process.	05	15
4.	<b>Exergy</b> Energy of a heat input in a cycle, exergy destruction in heat transfer process, exergy of finite heat capacity body, exergy of closed and steady flow system, irreversibility and Gouy-Stodola theorem and its applications, second law efficiency.	05	08
5.	<b>Vapour Power Cycles</b> Carnot vapor cycle, Rankine cycle, comparison of Carnot and Rankine cycle, Carnot cycle efficiency, variables affecting efficiency of Rankine cycle.	06	15
6.	<b>Gas Power Cycles</b> Carnot, Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, mean effective pressure, brake thermal efficiency, relative efficiency, Brayton cycle.	06	15
7.	<b>Properties of gases and gas mixtures</b> Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart, Gibbs-Dalton law, internal energy; enthalpy and specific heat of a gas mixtures.	06	12
8.	<b>Cryogenic Refrigeration System:</b> Ideal isothermal and reversible isobaric source refrigeration cycles, Joule Thomson system, cascade or pre-cooled Joule-Thomson refrigeration systems, expansion engine and cold gas effectiveness for the Philips refrigerators, Gifford single volume refrigerators analysis, COP, FOM, refrigerators, pulse tube refrigerators, various types of pulse tube refrigerator. <b>Refrigerators using solids as working media</b> Magnetic cooling, magnetic refrigeration systems, thermal, valves, nuclear demagnetization.	04	08
<b>TOTAL</b>		45	100

**Text Book (s):**

Title	Author/s	Publication
Engineering Thermodynamics	P.K. Nag	McGraw-Hill Education

**Reference Book(s):**

Title	Author/s	Publication
Fundamentals of Thermodynamics	Borgnakke & Sonntag	Wiley India (P) Ltd.
Thermodynamics - An Engineering Approach	Yunus Cengel & Boles	McGraw-Hill Education
Engineering Thermodynamics	Gordon Rogers & Yon Mayhew	Pearson Education Ltd.
Engineering Thermodynamics	Jones and Dugan,	PHI Learning Pvt. Ltd

**Web Material Links:**

- <http://nptel.ac.in/courses/112105123/1>

**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.

**Course Outcome(s):**

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

SEME2301	ENGINEERING THERMODYNAMICS
CO 1	Interpret basic terminologies of thermodynamics.
CO 2	Define and demonstrate the laws of thermodynamics and its application in routine life.
CO 3	Interpret the concept of entropy and exergy.
CO 4	Analyze different gas and vapour power cycles and its applications to the diff. power plants.
CO 5	Identify different laws and its application related to gases and its mixtures.

**Mapping of CO with PO**

SEME2301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	1	1	1		1				1	
CO 2	2	1	2			1				1	
CO 3	1		2	1	1	2	1			1	1
CO 4	2	2	1	2	2				1	2	1
CO 5	1	2		1		2					

**Mapping of CO with PSO**

SEME2301	PSO1	PSO2	PSO3
CO 1	2	1	1

CO 2	2	1	2
CO 3	3	3	2
CO 4	3	3	2
CO 5	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	Basic Concepts of Thermodynamic	1, 2
2	First and Second law of Thermodynamics	1, 2, 3
3	Entropy	1, 2, 3
4	Exergy	1, 2, 3
5	Vapour Power Cycles	2, 5
6	Gas Power Cycles	2, 5
7	Properties of gases and gas mixture	1, 2, 3
8	Refrigeration and Liquefaction	2, 3, 5

**P P Savani University**  
**School of Engineering**

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**Department of Mechanical Engineering**

Course Code: SEME2311

Course Name: Material Science & Metallurgy

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	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- identify the different materials and their properties described.
- understand the microstructures, crystallography, defects, and phase diagrams of different materials.
- understand the process involved in mechanical testing of materials and their deformation under certain conditions.
- understand the role of heat treatment to achieve desired variation in properties of materials.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Materials</b> Classification of Engineering Materials, Engineering requirements of materials, Methods/Tools to reveal the different levels of structure. Defects-Point, Line, Planar; Crystal geometry and Crystal Imperfections: Unit Cell, Crystal structure, Bravais lattice, atomic packing, coordination number, crystal structures of metallic elements, crystal directions and planes, Miller indices, Polymorphism or Allotropy. Crystal structure and correlated properties. Diffusion processes, Mechanism of crystallization - nucleation and growth, factors influencing nucleation and growth, Imperfections in crystals and their effect on properties, Solute strengthening, Corrosion.	07	13

2.	<p><b>Phase Diagrams and Phase Transformation</b> Phase, Gibbs's Phase rule, Solubility and Solid Solutions, Iso-morphous alloy system, Eutectoid and Peritectic system, Evolution of Microstructure, Phase Transformation-Temperature-Time-Transformation (TTT) and Continuous Cooling Transformation (CCT) Diagrams, Electro Microscopy.</p>	07	11
3.	<p><b>Solidification of Metals</b> Solidification of metals and an alloy, Nucleation and Growth during freezing of pure metal and alloy ingot/a casting Resultant macrostructures; Effects of Structure on Mechanical Properties, Methods to control the grain structure resulting from solidification, Solidification defects like porosity and shrinkage and remedies. Cooling curve of pure metal and alloy.</p>	06	11
4.	<p><b>Heat Treatment</b> Annealing and its types, Normalizing, Aus-tempering, Martempering, Quenching and Temper heat treatment, Hardenability, Applications of above processes for the industrial practices. <b>Surface hardening processes</b> Flame and induction hardening, Carburizing, Nitriding and Carbonitriding, Applications of above processes for the industrial practices.</p>	04	14
5.	<p><b>Powder Metallurgy</b> Application and advantages, Production of powder, Compacting, Sintering, Equipment and process capability.</p>	03	07
6.	<p><b>Cast Iron and Alloy steel</b> Iron-Iron Carbide and Iron-carbon diagrams, Transformations resulting into White Cast Iron, Grey Cast Iron, Malleable Cast Iron, S. G. Iron, Alloy Cast Iron. Their microstructures and correlated properties and applications, IS Codification, Purpose of alloying, General effect of alloying elements on ferrite, carbide, transformation temperature, hardenability and tempering. Types of steel: Chromium, Manganese, Molybdenum and Manganese steels, IS Codification, Tool Steels Classification, properties, applications and IS and ISO Codification.</p>	10	22
7.	<p><b>Non-Ferrous Alloys</b> Non-Ferrous Alloys of Aluminium, Magnesium, Copper, Nickel, Titanium, Microstructure and mechanical property relationships; Composite, Classification, Processing, Metal Matrix</p>	04	07

8.	<b>Mechanical Behavior of Metals</b> Properties of metals, Deformation of metals, Mechanisms of deformation, Deformation in polycrystalline materials, Mechanical testing of materials (destructive & nondestructive) testing methods.	04	15
<b>TOTAL</b>		45	100

**List of Practical:**

Sr. No.	Name of Practical	Hours
1.	To understand construction and working of metallographic microscope.	02
2.	To study procedure of specimen preparation for microscopic examination and to carry out a specimen preparation.	04
3.	To understand what is micro examination, importance of micro examination and to study various ferrous, non-ferrous microstructures.	04
4.	To show the effect of different quenching media like Oil, Water and Brine on the hardness of medium carbon steel.	04
5.	To find out the effect of varying section size on hardenability of steel and obtain hardness distribution curves of hardened steel cross-section.	04
6.	To determine machine defects by dye -penetrant test and magnetic particle test.	04
7.	To determine the hardenability by Jominy end quench test.	04
8.	Study of different heat treatment processes- annealing, normalizing, hardening and tempering, surface and case hardening to improve properties of steel during processes and applications with the help of muffle furnace.	04
<b>TOTAL</b>		30

**Text Book(s):**

Title	Author/s	Publication
Callister's Material Science and Engineering	R. Balasubramaniam	Wiley India

**Reference Book(s):**

Title	Author/s	Publication
Materials Science and Metallurgy	O. P. khanna	Dhanpatrai Publication
Principles of Materials Science and Engineering	W F Smith	McGraw Hill
Elements of Material Science and Engineering	Lawrence H. Van Vlack,	Pearson Education

**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 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 following course outcomes will be able to:

SEME2311	MATERIAL SCIENCE & METALLURGY
CO1	Understand the basic concept of material science and metallurgy.
CO2	Know about the ferrous and non ferrous metals and alloys and their applications.
CO3	Understand and apply various heat treatment process to get desired material properties.
CO4	Examine the mechanical properties of metals through various destructive and non destructive methods.
CO5	Understand the importance of powder metallurgy & judge the scope and limitations of different materials.

**Mapping of CO with PO**

SEME2311	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	2	3	2			3	3	1			
CO 2	2	3	2			3	3	3	2	1	1
CO 3	2	3	2			3	3	3	2		2
CO 4	2	3	3	3	3	3	3	3	1	2	2
CO 5	2	3	2			3	3		2		1

**Mapping of CO with PSO**

SEME2311	PSO1	PSO2	PSO3
CO 1	1	3	2
CO 2	1	3	1
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
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1	Introduction to Materials	1
2	Phase diagrams and phase transformation	1, 2, 4
3	Solidification of Metals	2, 4
4	Heat Treatment, Surface hardening process	3, 5
5	Powder Metallurgy	2, 5
6	Cast Iron and Alloy Steel	1, 2
7	Non Ferrous Alloys	1, 2
8	Mechanical Behaviour of Metals	2, 3, 5
9	Polymers, Ceramics and Composites	2, 4
10	Energy Materials	1,2

**P P Savani University**  
**School of Engineering**

**Department of Mechanical Engineering**

Course Code: SEME2321

Course Name: Manufacturing Technology - I

Prerequisite Course(s): -- SEME1020 – Engineering Workshop

**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 various manufacturing techniques.
- learn the background for higher level subjects in engineering like Production Technology.
- understand the relevance and importance of the Different manufacturing techniques and real-life application in industry.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Manufacturing Processes</b> Basic Introduction, Economics and Technological Definition, Importance of Manufacturing, Classification and Selection of Manufacturing Processes.	02	05
2.	<b>Patternmaking and Foundry</b> Patterns, Allowances, Types of patterns, Moulding materials, Moulding sands; properties and sand testing: Grain fineness, moisture content, clay content and permeability test. Core materials and core making, Gating & Riser systems, Spure, Gating, Ration, Cupola, Inspection and Cleaning of casting, Casting defects.	12	25
3.	<b>Miscellaneous Casting Process</b> Shell moulding, Die casting, investment Casting, Carbon dioxide molding process, Centrifugal casting, Slush casting, Continuous casting process, Advanced technologies in casting.	08	18

4.	<b>Gas Welding</b> Principles of gas welding, Types of gases used, Types of flames, Welding techniques, Edge preparation, Equipment used, Torch, Regulators, Welding filler rods, Gas cutting, Principles of gas cutting, Position of torch, Soldering, Brazing, Adhesive bonding.	08	16
5.	<b>Electric Arc Welding</b> Principles of electric arc welding, A.C. / D.C. welding, Edge preparation, Equipment used, ISI electrode classification: Designation and selection, Manual metal arc welding, Carbon arc welding, Inert gas shielded arc welding, TIG & MIG, Submerged arc welding, Atomic hydrogen arc welding, Plasma arc welding, Stud arc welding, Arc cutting.	04	08
6.	<b>Resistance Welding</b> Principles of resistance welding, Heat balance, Electrodes, Spot welding, Seam welding, Projection welding, Upset welding, Flash welding, Fusion welding processes: Thermit welding, electro-slag welding, Electron beam and laser beam welding.	04	10
7.	<b>Solid-State and Advanced Joining Processes</b> Solid-state welding: friction welding, friction stir welding, ultrasonic welding, diffusion bonding, Brazing and soldering: principles, materials, applications, Adhesive bonding, Introduction to advanced manufacturing: additive manufacturing basics, hybrid processes	03	08
8.	<b>Green Manufacturing</b> Why Green Manufacturing, Motivations and Barriers to Green Manufacturing, Environmental Impact of Manufacturing, Strategies for Green Manufacturing. The Social, Business, and Policy Environment for Green Manufacturing: Introduction, The Social Environment—Present Atmosphere and Challenges for Green Manufacturing, The Business Environment: Present Atmosphere and Challenges, The Policy Environment—Present Atmosphere and Challenges for Green Manufacturing.	04	10
	<b>TOTAL</b>	45	100

**List of Practical:**

Sr No	Name of Practical	Hours
1.	Study of different types of patterns & types of molding methods	02
2.	Design of Gating system & Design of Riser	02
3.	To Find out the Moisture Content, Permeability and Hardness of Moulding Sand	04
4.	Casting Defects, their Causes and Remedies	02
5.	Tutorial on Casting Simulation	04

6.	Study different Welding Processes, Weld Joint Design as per I.S. code and Weld Symbols	04
7.	Gas Welding and Gas Cutting Processes	04
8.	MIG & TIG Welding Process	04
9.	Resistance Welding Process	04
	<b>TOTAL</b>	<b>30</b>

**Text Book(s):**

Title	Author/s	Publication
Manufacturing Technology Vol. II	P.N. Rao	Tata McGraw Hill
A Textbook of Production Technology	Sharma P. C.	S. Chand

**Reference Book(s):**

Title	Author/s	Publication
Manufacturing Technology – I	Rao	Tata McGraw Hill
A Textbook of Production Engineering	Sharma P.C.	S. Chand
Manufacturing Processes and Systems	Phillip F., Ostwald, Jairo Munoz	Wiley India
Elements of Workshop Technology V. II	Chaudhary	MPP
Manufacturing technology	Rao	Atul
Work shop Technology -1	Hajra	MPP

**Web Material Links:**

- <https://nptel.ac.in/courses/112107145>

**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 following course outcomes will be able to:

<b>SEME2321</b>	<b>MANUFACTURING TECHNOLOGY – I</b>
CO1	Articulate basic knowledge of manufacturing processes to implement in professional skills.
CO2	Describe patternmaking process and casting defects
CO3	Differentiate various casting processes for good manufacturing practices.
CO4	Demonstrate gas welding and cutting process for different application
CO 5	Identify, classify and apply arc & resistance welding processes used for various applications in industrial practice.

#### Mapping of CO with PO

<b>SEME2321</b>	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

<b>SEME2321</b>	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

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1	Manufacturing Processes	1, 2, 4, 6
2	Patternmaking and Foundry	1, 2, 5, 6
3	Miscellaneous Casting Process	1, 2, 6
4	Gas Welding	1, 2, 5
5	Electric Arc Welding	2, 5, 6
6	Resistance Welding	2, 5, 6
7	Green Manufacturing	1, 2, 3

**P P Savani University  
School of Engineering**

**Department of Civil Engineering**

Course Code: SECV2310  
Course Name: Mechanics of Solids  
Prerequisite Course/s: - SECV2210  
Mechanics of Solids

**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.	<b>Introduction:</b> 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.	<b>Fundamental of Static:</b> Force, Types of Forces, Characteristics of a Force, System of Forces, Composition and Resolution of Forces. <b>Concurrent Forces:</b> 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. <b>Non-Concurrent Forces:</b> 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.	<b>Centroid and Centre of Gravity:</b> Centroid of Lines, Plane Areas and Volumes, Examples Related to Centroid of Composite Geometry, Pappus –Guldinus Theorems.	05	10

4.	<b>Moment of Inertia:</b> 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.	<b>Mechanical Properties of Materials:</b> 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.	<b>Strain Energy Methods &amp; Advanced Topics</b> Castigliano's theorems, virtual work, principle of minimum potential energy, Introduction to stability and buckling of beams and frames	04	10
7.	<b>Simple Stress and Strain:</b> 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.	<b>Shear Force and Bending Moment:</b> 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
<b>TOTAL</b>		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
<b>TOTAL</b>		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.
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### 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	PO7	PO8	PO9	PO10	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 Science & Humanities**

Course Code: SESH2220

Course Name: Numerical Analysis & Applied 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	--	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners 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:**

Module No.	Content	Hours	Weightage in %
1	<b>Approximations and Errors:</b> Errors and Their computations, General error formula. <b>Solution of Algebraic and Transcendental Equations:</b> Bracketing Methods (Bisection, Secant, Method of False Position), Convergence of Iterative Methods, Newton-Raphson Method, Newton-Raphson Method	07	14
2	<b>Numerical Solutions of Linear Equations</b> Gauss-Seidel Method Iteration Method, Jacobi's Method, Gauss-Seidel Method, Eigen Value Problem.	05	07
3	<b>Numerical Differentiation</b> Finite Differences: Forward, Backward and Divided Differences Table, Newton's Forward, Backward and Divided Differences Interpolation Formula, Interpolation Polynomials, Lagrange Interpolation Formula Interpolation	06	14
4	<b>Numerical Integration</b> Numerical Integration, Trapezoidal Rule, Simpson's 1/3-rule, Simpson's 3/8-rule.	04	10
5	<b>Numerical Methods for ODEs</b> Taylor's Series and Euler's Method, Modifications and Improvements in Euler's Method, Runge-Kutta 2nd Order & 4th Order Methods, Boundary Value Problems.	07	11

6	<b>Basics of Statistics</b> Elements, Variables, Observations, Quantitative and Qualitative data, Cross-sectional and Time series data, Frequency distribution, Dot plot, Histogram, Cumulative distribution	04	10
7	<b>Regression Analysis</b> 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	05	16
8	<b>Probability Distribution</b> Introduction, Conditional probability, Independent events, independent experiments, Bayes' theorem, Probability distribution, Binomial distribution, Poisson distribution, Normal distribution.	07	18
	<b>TOTAL</b>	45	100

**List of Tutorial(s):**

Sr. No.	Name of Practical	Hours
1.	Approximations and Errors	2
2.	Solution of Algebraic and Transcendental Equations	4
3.	Numerical Solutions of Linear Equations	2
4.	Numerical Differentiation	2
5.	Numerical Integration	2
6.	Numerical Methods for ODEs	2
7.	Basics of Statistics	4
8.	Regression Analysis	4
9.	Probability-1	4
10.	Probability-2	4
	<b>TOTAL</b>	30

**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 &	B. S. Grewal	Khanna Publishers,

Science		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 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 the performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 100 marks.

#### Course Outcome(s):

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

SESH2220	NUMERICAL ANALYSIS & APPLIED 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

SESH2220	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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	3	1	1								2

**Mapping of CO with PSO**

SESH2220	PSO1	PSO2	PSO3
CO 1	2	2	
CO 2	1	2	
CO 3	1	2	
CO 4	2	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.	Solution of Algebraic and Transcendental Equations	1, 2, 3, 4, 6
2.	Numerical Solutions of Linear Equations	1, 2, 3, 5
3.	Numerical Differentiation	1, 2, 3, 5
4.	Numerical Integration	1, 2, 3, 5
5.	Numerical Methods for ODEs	1, 2, 3, 5, 6
6.	Basics of Statistics-I	1, 2, 3, 4, 5
7.	Basics of Statistics-II	1, 2, 3, 4, 5
8.	Probability Distribution	1, 2, 3, 4, 5

**P P Savani University**  
**School of Engineering**

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**Department of Mechanical Engineering**

Course Code: SEME2370

Course Name: Machine Drawing

Prerequisite Course(s): SEME1010 - Engineering Graphics

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
00	04	00	02	00	00	40	60	00	00	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- understand the industrial drawing.
- learn a machining and welding symbols.
- know the part and assembly drawings.
- know an application of screw threads, screw fasteners, welding and riveted joints.

**List of Practical:**

Sr No	Name of Practical	Hours
1.	Sheet of Machining Symbols and Surface Textures	03
2.	Sheet of Types of Screw Threads	03
3.	Drafting Exercise of Types of Nuts and Bolts	04
4.	Sheet of Types of Keys, Cotter and Knuckle Joint	04
5.	Sheet of Types of Riveted Joints, Welding Joints and Welding Symbols	02
6.	Sheet of Plummer Block or Pedestal Bearing	02
7.	Drafting Exercise of Part in Drafting software	12
8.	Parts designing using software tools	10
9.	Study of force analysis using software	13
10.	Assembly and disassembly of parts	07
	<b>TOTAL</b>	60

**Text Book(s):**

Title	Author/s	Publication
Machine Drawing	N. D. Bhatt, V. M. Panchal	Charotar Publishing House Pvt. Ltd.

**Reference Book(s):**

Title	Author/s	Publication
Machine Drawing	N. Sidheshwar, P. Kannaiah, V. V. S. Sastry	Tata McGraw Hill Publication

**Web Material Links:**

- <http://nptel.ac.in/syllabus/112106075/>

**Course Evaluation:****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:

SEME2370	MACHINE DRAWING
CO1	Illuminate machining and welding symbols and its representation in the industrial drawings.
CO2	Interpret and differentiate part and assembly drawing.
CO3	Explore various types of screw threads, screw fasteners, welding, riveted and pin joints and its applications.
CO4	Understand limit, fits and tolerance systems and its representation in drawings.
CO5	Discover the drafting software to create 2D and 3D geometry.

**Mapping of CO with PO**

SEME2370	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	3	2		3				3		3
CO 2	2	3	3	3		3				3		3
CO 3	2	3	3	3		3						3
CO 4	2	3	3	3		3		3		3		3
CO 5	2	3	3	3	3	3	1			3		3

**Mapping of CO with PSO**

SEME2370	PSO1	PSO2	PSO3
CO 1	3	2	1
CO 2	3	2	
CO 3	2	2	
CO 4	2	2	

CO 5	3	2	3
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### 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	Sheet of Machining Symbols and Surface Textures	1, 2,3
2	Sheet of Types of Screw Threads	1, 2, 3
3	Drafting Exercise of Types of Nuts and Bolts	1, 2, 3,4
4	Sheet of Types of Keys, Cotter and Knuckle Joint	1, 2,3,4
5	Sheet of Types of Riveted Joints, Welding Joints and Welding Symbols	1,2,3,4
6	Sheet of Plummer Block or Pedestal Bearing	1,2,3,4
7	Drafting Exercise of Part in Drafting software	1,2,3,4,5
8	Parts designing using software tools	1,2,3,4,5,6
9	Study of force analysis using software	1,2,3,4,5
10	Assembly and disassembly of parts	1,2,3,4

**P P Savani University**  
**School of Engineering**

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**Department of Mechanical Engineering**

Course Code: SEME2350

Course Name: Fluid Mechanics

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	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- understand basic fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
- learn Fluid Properties.
- understand the importance of flow measurement and its applications in Industries and to obtain the loss of flow in a flow system.

**Course Content:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Properties of Fluids</b> Density, Viscosity, Surface Tension, Compressibility, Capillary, Vapour Pressure, Bulk Modulus, Cavitation, Classification of Fluids	02	5
2.	<b>Fluid Statics</b> Force and Pressure, Pascal's law of Pressure at a point, Pressure measurement by Manometers – U tube, Inclined U tube and Differential, 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.	06	14
3.	<b>Fluid Kinematics</b> Steady and Unsteady Flow, One – two and three Dimensional Flow,		

	Uniform and Non Uniform Flow, Rotational and Irrotational Flow, Stream Lines and Stream Function, Velocity Potential Function, Relation between stream and velocity potential function, Flow nets, Continuity Equation for 2D and 3D flow in Cartesian co-ordinates system	07	16
4.	<b>Fluid Dynamics</b> 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 Venturimeter, Pipe Orifice and Rotameter.	06	15
5.	<b>Dimensional Analysis</b> Dimensions, Dimensional Homogeneity, Raleigh and Buckingham $\pi$ Theorem, Non-Dimensional Numbers, Similarities - Geometrical, Kinematics and Dynamic.	05	10
6.	<b>Flow Through Pipes &amp; Open Channels</b> Major and Minor Losses in Pipes, Losses in Pipe Fittings, Hydraulic Gradient line and Total energy line, Equivalent Pipes, Pipes in series and parallel, Siphon, Power transmission through pipe, Moody's Diagram, Darcy Weishbach Equation, Types of open channel flow, Specific Energy and Specific Force, Critical Flow, Hydraulic Jump, Measurement of Discharge in open Channels.	07	16
7.	<b>Viscous Flow</b> Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe- Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing, measurement of viscosity. <b>Boundary Layer Theory</b> Concept of Boundary Layer, Boundary layer Thickness, Momentum Thickness, Displacement Thickness, Drag and Lift, Separation of Boundary layer, Streamlined and Bluffed Bodies.	08	16
8.	<b>Nano Fluids</b> Introduction to nanofluids, nanostructure materials, base fluids, dispersion, sonication and stable suspension. Various types of nanofluids-volumetric concentration. Thermophysical properties: Density; principles of measurement and apparatus. Theoretical equations to determine the density of different nanofluids. Viscosity: principles of measurement and apparatus. Andrade's and other theoretical equations. Effect of volumetric concentration and temperature. Effect of subzero temperature on nanofluid viscosity.	04	08
	<b>TOTAL</b>	45	100

**List of Practical:**

Sr No	Name of Practical	Hours
1.	Determine metacentric height of floating body.	02
2.	Measurement of pressure using different types of manometers.	02
3.	Determine Co-efficient of Discharge by venturimeter, Orificemeter and Rotameter.	06
4.	Verification of Bernoulli's apparatus.	02
5.	Measurement of velocity of flow using Pitot tube.	02
6.	Measurement of Friction factor for Different pipes.	04
7.	Measurement of viscosity using Redwood Viscometer.	02
8.	Determine discharge through triangular notch.	02
9.	Determine discharge through trapezoidal notch.	02
10.	Determine discharge through rectangular notch.	02
11.	Determine different flow patterns by Reynolds's apparatus.	02
12.	Determine friction loss for different pipes fittings	02
	<b>TOTAL</b>	30

**Text Book(s):**

Title	Author/s	Publication
Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications

**Reference Book(s):**

Title	Author/s	Publication
Fluid Mechanics	Frank M. White	Tata McGraw Hill Publication
Fluid Mechanics	R.K.Rajput	Schand Publication
Introduction to Fluid Mechanics and Fluid Machines	S.K.Som & Biswas.G	Tata McGraw Hill Publication

**Web Material Links:**

- <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 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 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	PO12
CO 1	2			2	1				3			1
CO 2	3	2	2	3	2				3			
CO 3	3	2		3	2	1			3		2	1
CO 4	3	3		3	2				3		1	1
CO 5	3	1		3	3	1			3		2	

**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
9	Nano Fluids	1, 2, 3, 4

**P P Savani University**  
**School of Engineering**

**Department of Mechanical Engineering**

Course Code: SEME2360

Course Name: Mechanical Measurement & Metrology

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	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help the learners to

- know various types and methods of measurement.
- assess the suitability of measuring instruments.
- describe the basic concepts of metrology.
- know how to operate different types of mechanical measuring instruments.
- explain the different instruments used in industry.
- evaluate quality of surface produced using various methods of measurements.

**Course Content:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Principles of Metrology</b> Concept of Metrology, Need for inspection, Linearity, Repeatability, Sensitivity and readability, Precision & Accuracy, Standards of measurements.	02	05
2.	<b>Screw threads and gear Metrology</b> Measurement of Screw thread: Screw terminology, Errors in threads, measuring elements of the internal and external threads. Measurement of Gear: Introduction and Classification of gears, Forms of gear teeth, Gear tooth terminology, Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile and pitch, Gear Errors.	08	15
3.	<b>Surface Roughness Metrology</b> Introduction, Surface Texture, Methods of Measuring Surface finish,	04	12

	Comparison Methods and Direct Instrument Measurement, Sample Length, Numerical Evaluation of Surface Texture, Indication of Surface roughness Symbols used, Adverse effects of poor surface finish		
4.	<b>Straightness, Flatness, Squareness, Parallelism and Machine Tool Tests</b> Introduction, Measurement of Straightness, Flatness, Squareness and Parallelism, run out and concentricity, Tool makers microscope, Interferometry and its use in checking flatness, surface contour, parallelism etc., Interferometers and optical flats, Introduction to Machine tool testing; Various Alignment test on lathe, Milling Machine, Drilling Machine etc.	05	13
5.	<b>Temperature measurement</b> Temperature scales, Temperature measuring devices, Methods of Temperature Measurement, Expansion Thermometers; Filled System thermometers; Electrical Temperature Measuring Instrument, Pyrometers; Calibration of Temperature Measuring Instruments, Reliability and calibration.  <b>Miscellaneous Metrology</b> Measurement of Force, Torque, Power, Measurement of displacement, Velocity and Acceleration, Measurement of Speed and Frequency	10	14
6.	<b>Measurement Concept</b> Economics of measurement, Need of mechanical measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments, Threshold, Drift, Zero stability, loading effect and system response. Source of Errors and their classification. Methods of measurement and performance characteristics	06	14
7.	<b>Linear Measurements</b> Precision and Non-precision linear Measurements, Vernier caliper, Micrometer, Use of End standard – Slip Gauge, Indian standard on Slip gauge, Care and use of slip gauge for workshop and inspection purpose, Telescopic gauge, Comparators.	06	14
8.	<b>Angular and Taper Measurements</b> Introduction; Working principle and construction of Angular Measuring instruments like Protractors, Sine bars, Sine Centre, Angle gauges, Spirit level, Clinometers, Angle dekkor, Taper Measuring Instruments: Measurement of taper shafts and Holes	04	13
	<b>TOTAL</b>	45	100

**List of Practical:**

Sr No	Name of Practical	Hours
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1.	Study of various instrument characteristics	02
2.	Study, Use and calibration of Linear Measuring Instruments	08
3.	Study and use of slip gauge	02
4.	Study of angle measurement using (a) Bevel Protractor (b) Combination Set and (c) Sine Bar	08
5.	Study of Temperature Measurement	02
6.	Study of Surface Roughness Tester	02
7.	Study of Gear Tooth Measurement	02
8.	Study Strain gauge Transducer	04
9.	Study of Coordinate Measuring Machines (CMM) (Industrial Visit)	-
	<b>TOTAL</b>	30

**Text Book(s):**

Title	Author/s	Publication
Textbook Of Metrology	M. Mahajan	Dhanpat rai & Co.

**Reference Book(s):**

Title	Author/s	Publication
Mechanical Measurement and Metrology	R K Jain	Khanna Publisher
Mechanical Measurements and Instrumentations	R K Rajput	Kataria Publication
Mechanical Measurements	Beckwith & Buck	Narosa publishing House
Metrology and Measurement	Anand Bewoor & Vinay Kulkarni	McGraw-Hill
Mechanical Measurements & Control	D. S. Kumar	Metropolitan books co pvt ltd

**Web Material Links:**

- <http://nptel.ac.in/courses/112106179>

**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 following course outcomes will be able to:

SEME2360	MECHANICAL MEASUREMENT & METROLOGY
CO 1	Select linear and angular measuring instrument for measurement of various components
CO 2	Distinguish between various gears and screws by measuring their dimensions
CO 3	Measure surface finish of the component produced
CO 4	Compare appropriate temperature measuring device for various applications
CO 5	Describe methods of measurement for various quantities like force, torque, power, displacement.

**Mapping of CO with PO**

SEME2360	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2		1	1						2	
CO 2	2	1	1	1	3		3					2
CO 3	2		1	2	2	1	3		2		2	2
CO 4	2				3		3	1	2			2
CO 5	2	3	1	2	3	1	3	1	2		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

Module No	Content	RBT Level
1	Principles of Metrology	1,2, 3
2	Screw threads and gear Metrology	2, 4, 5
3	Surface Roughness Metrology	2, 4 , 5
4	Straightness, Flatness, Squareness, Parallelism and Machine Tool Tests	2, 4, 5
5	Miscellaneous Metrology	2, 3, 4, 5
6	Measurement Concept	2, 4, 5
7	Linear Measurements	2, 5
8	Angular and Taper Measurements	2, 5
9	Temperature Measurement	2, 5
10	Inspection Technologies	2, 3, 4, 5

**P P Savani University**  
**School of Engineering**

**Department of Mechanical Engineering**

Course Code: SEME2380

Course Name: Theory of Machines

Prerequisite Course(s): SECV1030-Engineering Mechanics

**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 the learners to learn:

- basics types of mechanism, degree of freedom, joints.
- about velocity and acceleration analysis for different mechanism.
- about kinematic analysis of cam and follower motion.
- about types of belts, ropes, chain and gears drives and its applications.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Basics of Mechanisms</b> Introduction, Mechanism and machine, Rigid and resistant body, Link, Kinematic pair, Types of motion, Degrees of freedom (mobility), Classification of kinematic pairs, Kinematic chain, Linkage, Mechanisms, Kinematic inversion, Inversions of slider crank chain, Synthesis of Mechanism, Double slider- crank chain, Quick return mechanism, Limiting Positions and Mechanical Advantage.	06	10
2.	<b>Velocity Analysis</b> Vectors, Displacement of a rigid body, Relative displacement, Definition of velocity, Angular velocity, Rotation of a rigid body, Translation and rotation of a rigid body, Relative velocity method (graphical and analytical), Instantaneous axes of motion, Properties of instantaneous centers, The Aronhold - Kennedy theorem of three centers, Velocity analysis by instantaneous centers. The line-of-centers method, Velocity analysis by components, Velocity images, Velocity diagrams.	06	10

3.	<b>Acceleration Analysis</b> Definition of acceleration, Angular acceleration, A general case of acceleration, Radial and transverse components of acceleration, The coriolis component of acceleration, Examples of acceleration analysis, Acceleration diagrams.	06	10
4.	<b>Kinematics of Belts, Ropes and Chain Drives</b> Introduction, Belt and rope drives, Open and crossed belt drives, Velocity ratio, Slip, Materials for belt and ropes, Law of belting, Length of belt, Ratio of friction tensions, Power transmitted, Centrifugal effect on belts, Maximum power transmitted by a belt, Initial tension, Creep, Chains, Chain length, Angular speed ratio, Classification of chains.	07	15
5.	<b>Kinematics of Gears</b> Introduction, Classification of gears, Gear terminology, Law of gearing, Velocity of sliding, Forms of teeth, Cycloidal profile teeth, Involute profile Teeth, Comparison of Cycloidal and involute tooth forms, Path of contact, Arc of contact, number of pairs of teeth in contact, Interference in involute gears, Minimum number of teeth, Interference between rack and pinion, Undercutting, Introduction to helical, Spiral, Worm, Worm gear and bevel gears.	15	15
6.	<b>Kinematics of Cams</b> Introduction, Types of cams, Types of followers, Cam terminology, Displacement diagrams, Motions of the follower, Graphical construction of cam profile, High Speed CAM.	08	10
7.	<b>Balancing of rotating and reciprocating masses</b> Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses- Primary, Secondary balancing of reciprocating masses using Analytical methods.	06	15
8.	<b>Flywheels &amp; Governors</b> Significance of flywheel, Turning moment and crank effort diagrams for reciprocating machines, coefficient of fluctuation of speed and energy, Limiting velocity of flywheel. Classification of Governors, Working principle of centrifugal governors, Sensitivity of governor, Characteristics of governors, Hunting of governors.	06	15
<b>TOTAL</b>		60	100

**List of Practical:**

Sr No	Name of Practical	Hours
1.	To measure the ratio of time of cutting stroke to the return stroke in shaping machine by varying the stroke length.	02
2.	To understand the ratio of time of cutting stroke to the return stroke in shaper machine by varying the stroke length.	08

3.	To estimate kinematic data related to bicycle free wheel sprocket mechanism and Geneva mechanism.	02
4.	To prepare different kinematic links and to determine velocity and acceleration by relative velocity method for analysis of motion links.	08
5.	To draw a radial cam profile for given follower type to obtain desired follower motion.	02
6.	To estimate the slip, length of belt, angle of contact in open and cross belt drive.	02
7.	To estimate the Velocity of sliding, Path of contact, Arc of contact, number of pairs of teeth in contact in gears.	02
8.	To measure radius and height of all types of governors for different rotational speeds and mass of balls.	04
	<b>TOTAL</b>	<b>30</b>

**Text Book(s):**

Title	Author/s	Publication
Theory of Machines	S. S. Rattan	Tata McGraw Hill Education

**Reference Book(s):**

Title	Author/s	Publication
Mechanism and Machine Theory	J.S Rao, R.V Dukkupati	Wiley Eastern Ltd.
Theory of Mechanism and Machine	Ghosh A., Malick A.K	East-West Pvt. Ltd.
Theory of Machines and Mechanisms	John J. Uicker, Gordon R. Pennock, Joseph E. Shigley	Oxford University Press

**Web Material Links:**

- <http://nptel.ac.in/courses/112104121/1>

**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 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:

<b>SEME2380</b>	<b>THEORY OF MACHINES</b>
CO 1	Understand the essential components of linkage and mechanism in the assembly of machines.
CO 2	Analyze the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
CO 3	Apply the concept of the belt, rope, and chains, in machines operations.
CO 4	Understand a power transmission machine's element and its mechanism to solve the problems associated with it.
CO 5	Design a layout of cam and follower for specific motion.

#### Mapping of CO with PO

<b>SEME2380</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
CO 1	1	1	2						2	1		
CO 2	1	1	1	1	1					1		1
CO 3	1	1	2		1				2	1	2	1
CO 4	1	1	2	1			1		2	1		
CO 5	1	1	3	1	1		2		2	1	2	1

#### Mapping of CO with PSO

<b>SEME2380</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO 1	3	2	
CO 2	3	3	1
CO 3	3	3	2
CO 4	3	2	1
CO 5	3	3	1

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

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

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1	Basics of Mechanisms	1, 2
2	Velocity Analysis	1, 2, 3, 5
3	Acceleration Analysis	1, 2, 3, 5
4	Kinematics of Belts, Ropes and Chain Drives	2, 5
5	Kinematics of Gears	2, 5
6	Kinematics of Cams	2, 5

