PPSU

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

B. TECH. (MECHANICAL ENGINEERING)

SYLLABUS BOOK

AY 2021-22

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

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

Graduates will demonstrate ability to:

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

PO No	PROGRAMME OUTCOMES
PO 1	Engineering knowledge: Apply knowledge of engineering fundamentals, science, mathematics & engineering specialization for the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate and analyze complex engineering problems leading to substantial conclusions using basic principles of mathematics, science and engineering.
PO 3	Design/development of solutions: Develop solutions for complex engineering problems and design system components or processes meeting specified needs having due consideration for the safety and societal & environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge & methods like design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid & viable conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for prediction and modeling of complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply cognitive learning by the contextual knowledge to assess societal, health, safety, legal and cultural issues and following responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge & skill needed for sustainable development.
PO 8	Values & Ethics: Apply basic moral values & ethical principles and pledge to professional ethics/norms and responsibilities of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual/as a team member or as a leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need, do necessary preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO No	PROGRAMME SPECIFIC OUTCOMES (PSO) MECHANICAL ENGINEERING
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.

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

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

Syllabus Book

B. Tech.
(Mechanical Engineering)

P P Savani University

School of Engineering

Effective From: 2021-22

Authored by: P P Savani University

CONTENT

Sr. No.	Content	Page No
1	Syllabi of First Year……..	1 to 28
2	Syllabi of Second Year……	29 to 73
3	Syllabi of Third Year……	74 to 112
4	Syllabi of Fourth Year……..	113 to 174

FIRST YEAR B. TECH.

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
TEACHING & EXAMINATION SCHEME FOR B. TECH. MECHANICAL ENGINEERING PROGRAMME AY:2021-22															
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	SESH1070	Fundamentals of Mathematics	SH	2	0	2	4	4	40	60	0	0	50	0	150
	SEME1010	Engineering Graphics	ME	3	4	0	7	5	40	60	40	60	0	0	200
	SEME1020	Engineering Workshop	ME	0	2	0	2	1	0	0	50	0	0	0	50
	SESH1210	Applied Physics	SH	3	2	0	5	4	40	60	20	30	0	0	150
	SEHV1010	Universal Human Values - I	SH	2	0	0	2	0	100	0	0	0	0	0	100
						Total	**20**	**14**							**650**
2	SESH1080	Linear Algebra & Calculus	SH	3	0	2	5	5	40	60	0	0	50	0	150
	SESH1240	Electrical & Electronics Workshop	SH	0	2	0	2	1	0	0	50	0	0	0	50
	SECV1040	Basics of Civil & Mechanical Engineering	CV	4	2	0	6	5	40	60	20	30	0	0	150
	SECV1080	Mechanics of Solids	CV	4	2	0	6	5	40	60	20	30	0	0	150
	SECE1010	Basics of Computer & Programming	CE	3	2	0	5	4	40	60	20	30	0	0	150
	CFLS1010	Linguistic Proficiency	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
						Total	**26**	**22**							**750**

P P Savani University
School of Engineering

Department of Applied Science and Humanities

Course Code: SESH1070
Course Name: Fundamentals of Mathematics
Prerequisite Course(s): Algebra, Geometry, Trigonometry & Pre-Calculus till 12th Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	-	02	04	40	60	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- Evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1	**Calculus** Limits, Continuity, Types of Discontinuity, Successive Differentiation, Rolle's Theorem, LMVT, CMVT, Maxima and Minima.	08	28
2	**Sequence and Series-I** Convergence and Divergence, Comparison Test, Integral Test, Ratio Test, Root Test, Alternating Series, Absolute and Conditional Convergence.	07	22
Section II			
Module No.	Content	Hours	Weightage in %
3	**Sequence and Series-II** Power series, Taylor and Macluarin series, Indeterminate forms and L'Hospitals Rule.	06	20
4	**Matrix Algebra** Elementary Row and Column operations, Inverse of matrix, Rank of matrix, System of Linear Equations, Characteristic Equation, Eigen values and Eigen vector, Diagonalization, Cayley Hamilton Theorem, Orthogonal Transformation	09	30
	TOTAL	30	100

List of Tutorial:

Sr. No.	Name of Tutorial	Hours
1.	Calculus-1	04
2.	Calculus-2	02
3.	Integration	04
4	Sequence and Series-1	04
5.	Sequence and Series-2	04
6.	Sequence and Series-3	02
7.	Matrix Algebra-1	04
8.	Matrix Algebra-2	02
9.	Matrix Algebra-3	02
10.	Matrix Algebra-4	02
	TOTAL	30

Text Book(s):

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

Reference Book(s):

Title	Author(s)	Publication
Advanced Engineering Mathematics	E Kreyszig	John Wiley and 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, Dr. Rama Verma	S. Chand

Course Evaluation:

Theory:

- of state and their application.
- learn the background for higher level subjects in engineering like Production Technology.
- 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 30 marks
- MCQ based examination consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

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

SESH1070	FUNDAMENTALS OF MATHEMATICS
CO 1	To recall the concepts of limit, continuity and differentiability for analysing mathematical problems.
CO 2	Explain concepts of limit, derivatives and integrals.
CO 3	Analyze the series for its convergence and divergence to solve real world problems.
CO 4	Evaluate linear system using matrices.
CO 5	Adapt the knowledge of eigenvalues and eigenvectors for matrix diagonalization

SESH1070	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	1	1								1
CO 2	3	2	1									1
CO 3	3	2	1	1								
CO 4	3	2	1									1
CO 5	3	3	1		1							1

Mapping of CO with PO

Mapping of CO with PSO

SESH1070	PSO1	PSO2	PSO3
CO 1	3		
CO 2	1	1	
CO 3	1	2	
CO 4	2	1	
CO 5	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	Calculus	1, 2, 3, 4
2	Sequence and Series – I	1, 2, 3, 4
3	Sequence and Series – II	1, 2, 3, 4
4	Matrix Algebra	1, 2, 3, 4

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1010
Course Name: Engineering Graphics
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	04	-	05	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

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

- know conventions and the methods of engineering drawing.
- interpret engineering drawings using fundamental technical mathematics.
- construct basic and intermediate geometry.
- improve their visualization skills so that they can apply these skills in developing new products.
- improve their technical communication skill in the form of communicative drawings.
- comprehend the theory of projection.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction:** Importance of the Course; Use of Drawing Instruments and accessories; BIS – SP – 46; Lettering, Dimensioning and Lines; Representative Fraction; Types of Scales (Plain and Diagonal Scales); Construction of Polygons.	03	05%
2.	**Engineering Curves:** Classification and Application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spiralalong with Normal and Tangent to each.	06	15%
3.	**Principles of Projections:** Types of Projections; Introduction of Principle Planes of Projections. **Projection of Points & Line:** Projection of Points in all four Quadrants; Projection of Lines with its inclination to one Referral Plane & two Referral Planes. **Projection of Plane:** Projection of Planes (Circular and Polygonal) with inclination to	14	30%

	one Referral Plane and two Referral Planes; Concept of Auxiliary Projection Method.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Projection and Section of Solids:** **Projection of solids:** Polyhedral, Prisms, Pyramids, Cylinder, Cone, Auxiliary Projection Method, One View, Two View and Three View Drawings. Missing View, Rules for Selection ofViews; Sectional View, Section Plane Perpendicular to the HP & VP and other Various Positions, True Shape of Sections.	08	14%
5.	**Orthographic Projection:** Types of Projections: Principle of First and Third Angle Projection - Applications & Difference; Projection from Pictorial view of Object, View from Front, Top and Sides; Full Section View.	07	18%
6.	**Isometric Projections and Isometric Drawing:** Isometric Scale, Conversion of Orthographic views into Isometric Projection, Isometric View or Drawing.	07	18%
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Introduction sheet (dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil, lettering)	08
2.	Plane scale and diagonal scale	04
3.	Engineering curves	08
4.	Projection of Points & Lines	06
5.	Projection of Planes	08
6.	Projection of solid & Section of solid	10
7.	Orthographic projection	08
8.	Isometric projection	08
	TOTAL	60

Text Book(s):

Title	Author(s)	Publication
A Text Book of Engineering Graphics	P J Shah	S. Chand & Company Ltd., New Delhi
Engineering Drawing	N D Bhatt	Charotar Publishing House, Anand

Reference Book(s):

Title	Author(s)	Publication
Engineering Drawing	P.S.Gill	S. K. Kataria & sons, Delhi
Engineering Drawing	B. Agrawal & C M Agrawal	Tata McGraw Hill, New Delhi
Engineering Drawing made Easy	K. Venugopal	Wiley Eastern Ltd

Web Material Link(s):

- http://nptel.ac.in/courses/105104148/

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

Course Outcome(s):

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

SEME1010	**ENGINEERING GRAPHICS**
CO 1	Learn and understand the bis standards, conventions and methods of engineering drawing.
CO 2	Explore the different methods to draw various engineering curves and its applications.
CO 3	Construct basic and intermediate geometry and comprehend the theory of projection.
CO 4	Improve visualization skills and apply it to develop a new product.

Mapping of CO with PO

SEME1010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1			2				3		1
CO 2	1	1	1		1					3		1
CO 3	1	1	1		1					3		1
CO 4	1	1	2		1					3		1

Mapping of CO with PSO

SEME1010	PSO1	PSO2	PSO3
CO 1	1		
CO 2	2	1	1
CO 3	2	1	1
CO 4	2	1	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	Introduction	1, 2, 6
2	Engineering Curves	2, 6
3	Principles of Projections, Projection of Points and Line, Projection of Plane	1, 2, 3, 4
4	Projection and Section of Solids	2, 3, 4, 6
5	Orthographic Projection	2, 5, 4
6	Isometric Projections and Isometric Drawing	2, 5, 4

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1020
Course Name: Engineering Workshop
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	
-	02	-	01	-	-	50	-	-	-	50

CE: Continuous Evaluation, ESE: End Semester Exam

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

List of Practical:

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

Text Book(s):

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

Reference Book(s):

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

Web Material Link(s):

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

Course Evaluation:

Practical:

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 10 for each practical/Tutorial and average of the same will be converted to 30 Marks.
- Internal Viva consists of 20 Marks.

Course Outcome(s):

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

SEME1020	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

SEME1020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2					2			2		1	2
CO 2						3		3	3		1	3
CO 3	2					2			1		1	3
CO 4	2								3		2	3
CO 5	2								3		2	3

Mapping of CO with PSO

SEME1020	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 Applied Science & Humanities

Course Code: SESH1210
Course Name: Applied Physics
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	20	30	-	-	150

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.

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Volt-Ampere Characteristics of Light Emitting Diode	02
2.	Volt-Ampere Characteristics of Zener Diode	02
3.	To determine value of Planck's constant (h) using a photovoltaic cell	02
4.	To determine the Hall coefficient (R) and carrier concentration of a given material (Ge) using Hall effect.	04
5.	To study the Capacitors in series and parallel DC circuit.	04
6.	To determine velocity of sound in liquid using Ultrasonic Interferometer	04
7.	To study RLC Series circuit.	02
8.	To determine numerical aperture of an optical fiber.	02
9.	Determination of Young's Modulus of given material.	04
10.	Analysis of errors.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Concept of the Modern Physics	A. Beiser	Tata McGraw-Hill Education
Basic electrical engineering	Kothari and Nagrath	Tata McGraw-Hill Education
Quantum Mechanics	P.M. Mathew, K. Venkatesan	Tata McGraw-Hill Education
Waves and Acoustics	Pradipkumar Chakrabarti Satyabrata Chawdhary	New Central Book Agency
Lasers and Nonlinear Optics	G.D. Baruah	Pragati Prakashan
Solid State Physics: Basic Electronics:	S.O. Pillai	New Age Internation Publishers

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 the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

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

Course Outcome(s):

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

SESH1210	APPLIED PHYSICS
CO 1	Understand the framework of quantum mechanics and apply the knowledge of basic quantum mechanics to construct one dimensional schrodinger's wave equation.
CO 2	Classify the phenomenon of acoustics and ultrasonic in various engineering field and apply it for various engineering and medical fields. Interpret the concept of nanotechnology and understand the synthesis and applications of nanomaterials from technological prospect.
CO 3	Discover the types and properties of superconductors. relate the behaviour of superconductors at high temperatures.
CO 4	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 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

SESH1210	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1			2						1
CO 2	2	3	2			2	3					3
CO 3	2	2	2			2	3					3
CO 4	2	3	2			2	3					3
CO 5	2	3	2			2	3					3

Mapping of CO with PSO

SESH121	PSO1	PSO2	PSO3

CO 1	3		
CO 2	3		
CO 3	3		
CO 4	2		
CO 5	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	Quantum Mechanics	2, 3
2	Acoustic Ultrasonic	1, 3
3	Solid State Physics	2, 4
4	Nanophysics	2, 6
5	Non-Linear Optics	1, 2
6	DC and AC Circuits Fundamentals	2, 3
7	Electronics	3, 6

P P Savani University
School of Engineering

Department of Applied Science and Humanities

Course Code: SESH1080
Course Name: Linear Algebra & Calculus
Prerequisite Course(s): -- Concept up to 12th Standard

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	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- 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.
- develop the tool of Fourier series for learning advanced Engineering Mathematics.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Vector Space** Concept of vector space, Subspace, Linear Combination, Linear Dependence and Independence, Span, Basis and Dimension, Row Space, Column Space and Null Space, Rank and Nullity.	09	20
2.	**Linear Transformation** Introduction of Linear Transformation, Kernal and Range, Rank and Nullity, Inverse of Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps, Matrix associated with linear map.	07	15
3.	**Inner Product Space** Inner Product, Angle and Orthogonality, Orthogonal projection,Gram-Schmidt process and QR Decomposition, Least square decomposition, Change of basis.	07	15
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Beta and Gamma function** Improper Integrals, Convergence, Properties of Beta and Gamma Function, Duplication Formula (without proof)	06	14
5.	**Fourier Series** Periodic Function, Euler Formula, Arbitrary Period, Even and Odd function, Half Range Expansion, Parseval's Theorem	08	18

6.	**Curve tracing** Tracing of Cartesian Curves, Polar Coordinates, Polar and Parametric Form of Standard Curves, Areas and Length in Polar co-ordinates	08	18
	TOTAL	45	100

List of Tutorial:

Sr. No.	Name of Tutorial	Hours
1.	Vector Space-1	04
2.	Vector Space-2	02
3.	Linear Transformation-1	04
4	Linear Transformation-2	02
5.	Inner Product-1	04
6.	Inner Product-2	02
7.	Beta and Gamma Function-1	04
8.	Beta and Gamma Function-2	02
9.	Curve tracing-1	04
10.	Curve tracing-2	02
	TOTAL	30

Text Book(s):

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

Reference Book(s):

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

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average 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 30 marks.
- MCQ based examination consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

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

SESH1080	LINEAR ALGEBRA & CALCULUS
CO 1	Determine the basis and dimension of vector spaces and subspaces.
CO 2	Discuss the matrix representation of a linear transformation given bases of the relevant vector space.
CO 3	Identify the ordinary differentials and partial differentials and solve the maximum and minimum value of function.
CO 4	Classify gamma, beta functions & their relation which is helpful to evaluate some definite integral arising in various branch of engineering.
CO 5	Construct the graphs for function with intervals and identify more application for function.

Mapping of CO with PO

SESH1080	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1										
CO 2	1											
CO 3	2	1										
CO 4	1	1										
CO 5	1											

Mapping of CO with PSO

SESH1080	PSO1	PSO2	PSO3
CO 1			
CO 2			
CO 3	1		
CO 4			
CO 5			

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

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

Module No	Content	RBT Level
1	Vector Space	1, 2, 3, 4
2	Linear Transformation	1, 2, 3, 4
3	Inner Product Space	1, 2, 3, 4
4	Beta and Gamma Function	1, 2, 4, 5
5	Fourier Series	1, 2, 4, 5
6	Curve Tracing	1, 2, 4, 5, 6

P P Savani University
School of Engineering

Department of Applied sciences & Humanities

Course Code: SESH1240
Course Name: Electrical & Electronics Workshop
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	
-	02	-	01	-	-	50	-	-	-	50

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- identify basic fundamental electronic components in circuits.
- learn to use common electronic component on breadboard.
- understand components of instruments, terminology and applications.

List of Practical:

Sr No	Name of Practical	Hours
1	Understanding of electronic component with specification.	02
2	Understanding of Galvanometer, Voltmeter, Ammeter, Wattmeter and Multimeter	02
3	Understanding of breadboard connections	02
4	Drawing and wiring of basic circuits on breadboard	02
5	Verification of Ohm's law	02
6	Half wave, full wave using centre tap transformer and full wave bridgerectifier	03
7	Kirchhoff's laws (KVL,KCL).	03
8	Faraday's laws of Electromagnetic Induction and Electricity Lab	04
9	LDR characteristics	02
10	Study of CRO, measurement of amplitude (voltage) & time period (frequency)	04
11	PCB designing	04
	TOTAL	30

Text Book:

Title	Author/s	Publication
Electronic Principles	Albert Malvino and David J Bates	Mc Graw Hill(7th Edition)

Reference Book:

Title	Author/s	Publication
Electronic Devices	Thomas L. Floyd	Pearson (7th Edition)
Electronic Devices and Circuits	David A. Bell	Oxford Press (5th Edition)
Integrated Electronics	Jacob Millman, Christos	Tata McGraw Hill (2nd Edition)

Course Evaluation:

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 20 Marks.
- Internal viva consists of 30 marks.

Course Outcome(s):

- After completion of the course, the students will be able to design elementary combinational and sequential circuits.

Course Outcome(s):

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

SESH1240	ELECTRICAL & ELECTRONICS WORKSHOP
CO 1	Identify the ability to design various electronic circuit on a bread board.
CO 2	Recognize the basic electronic devices and components in a circuit connection.
CO 3	Identify the ability to design a PCB.
CO 4	Define the practical side of basic physics laws.

Mapping of CO with PO

SESH1240	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	3	3	2	2		3			3
CO 2	2	3	2	3	3	2	2		3			3
CO 3	2	3	3	3	3	2	2		3			3
CO 4	2	3	2	3	3	2	2		3			3

Mapping of CO with PSO

SESH1240	PSO1	PSO2	PSO3
CO 1	3	2	
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	

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

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

Practical No	Content	RBT Level
1	Electronic Component	1, 2, 3, 4
2	Electronic Device	1, 2, 3, 4
3	Understanding of Brade Board	1, 2, 3, 4, 5, 6
4	Wiring of Bread board	1, 2, 3, 4, 5, 6
5	Ohm's Law	1, 2, 3, 4
6	Rectifier	1, 2, 3, 5, 6
7	KCL and KVL	1, 2, 3, 4, 6
8	LDR	1, 2, 3, 6
9	Electricity Lab	1, 2, 3, 4
10	CRO	1, 2, 4, 5
11	PCD	1, 2, 6

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV1040
Course Name: Basics of Civil & 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	
04	02	-	05	40	60	20	30	-	-	150

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Civil Engineering: An Overview** Introduction, Branches, Scope, Impact, Role of Civil Engineer, Unit of Measurement, Unit Conversion (Length, Area,Volume)	03	04
2.	**Introduction to Surveying and Levelling:** Introduction, Fundamental Principles, Classification **Linear Measurement:** Instrument Used, Chaining on Plane Ground, Offset, Ranging **Angular Measurement:** Instrument Used, Meridian, Bearing, Local Attraction **Levelling:** Instrument Used, Basic Terminologies, Types of Levelling, Method of Levelling **Modern Tools:** Introduction to Theodolite, Total Station, GPS	07	12
3.	**Building Materials and Construction:** Introduction (Types and Properties) to Construction Materials Like Stone, Bricks, Cement, Sand, Aggregates, Concrete, Steel. Classification of Buildings, Types of Loads Acting on Buildings, Building Components and their Functions, Types of Foundation and Importance, SymbolsUsed in Electrical Layout, Symbols Used for Water Supply, Plumbing and Sanitation	10	14

4.	**Construction Equipment:** 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	08
5.	**Recent Trends in Civil Engineering:** Mass Transportation, Rapid Transportation, Smart City, Sky Scarper, Dams, Rain Water Harvesting, Batch Mix Plant, Ready Mix Concrete Plant, Green Building, Earth Quake Resisting Building, Smart Material	06	12
	Section II		
Module No.	Content	Hours	Weightage in %
6.	**Basic Concepts of Thermodynamics:** Prime Movers - Meaning and Classification; the Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific Heat Capacity, Internal Energy, Specific Volume; Thermodynamic Systems, All Laws of Thermodynamics	04	08
7.	**Fuels and Energy:** Fuels Classification: Solid, Liquid and Gaseous; their Application, Energy Classification: Conventional and Non- Conventional Energy Sources, Introduction and Applications of Energy Sources like Fossil Fuels, Solar, Wind, and Bio- Fuels, LPG, CNG, Calorific Value	04	08
8.	**Basics of I.C Engines:** Construction and Working of 2 Stroke & 4 Stroke Petrol andDiesel Engines, Difference Between 2-Stroke - 4 Stroke Engine & Petrol-Diesel Engine, Efficiency of I. C. Engines	12	18
9.	**Power Transmission Elements:** Construction and Applications of Couplings, Clutches and Brakes, Difference Between Clutch and Coupling, Types of Belt Drive and Gear Drive	10	16
	TOTAL	60	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Unit conversation Exercise and Chart preparation of building components	02
2.	Linear measurements	02
3.	Angular measurements	02
4.	Determine R. L of given point by Dumpy level. (Without Change Point)	02
5.	Determine R. L of given point by Dumpy level. (With Change Point)	02
6.	Presentation on various topics as in module about recent trends	04
7.	To understand construction and working of various types of boilers	04
8.	To understand construction and working of mountings	04
9.	To understand construction and working of accessories	04

10.	To understand construction and working 2 –stroke & 4 –stroke Petrol Engines	02
11.	To understand construction and working 2 –stroke & 4 –stroke Diesel Engines	02
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Elements of Mechanical Engineering	S. B. Mathur, S. Domkundwar	Dhanpat Rai & Sons Publications
Elements of Mechanical Engineering	Sadhu Singh	S. Chand Publications
Elements of Civil Engineering	Anurag A. Kandya	Charotar Publication
Surveying Vol. I & II	Dr. B. C. Punamia	Laxmi Publication

Reference Book(s):

Title	Author(s)	Publication
Thermal Engineering	R. K. Rajput	Laxmi Publications
Basic Mechanical Engineering	T.S. Rajan	Wiley Eastern Ltd., 1996.
Surveying and Levelling	N. N. Basak	Tata McGraw Hill
Surveying Vol. I	S. K. Duggal	Tata McGraw Hill
Surveying and Levelling	R. Subramanian	Oxford University
Building Construction and Construction Material	G. S. Birdie and T. D. Ahuja	Dhanpat Rai Publishing
Engineering Material	S.C. Rangwala	Charotar Publication

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.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SECV1040	BASICS OF CIVIL & MECHANICAL ENGINEERING
CO 1	Apply the principles of basic mechanical engineering.
CO 2	Comprehend the importance of mechanical engineering equipments like IC engine and power transmission elements.
CO 3	Understand different structural loads, components, materials and equipments used in the construction of a building.
CO 4	Adapt various methods of area plotting and marking before starting the construction activity.

Mapping of CO with PO

SECV1040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	1	3	2	2						3
CO 2	2	3	1	3	2	2						3
CO 3	1	3	1	3	2	2						3
CO 4	1	3	1	3	2	2						3

Mapping of CO with PSO

SECV1040	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	2	2
CO 3	3	2	2
CO 4	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	Civil Engineering: An overview	1, 2, 3
2	Introduction to Surveying	1, 2
3	Building Materials and Construction	1, 2
4	Construction Equipment	1, 2
5	Recent Trends in Civil Engineering	1, 2
6	Basics Concept of Thermodynamics	1, 2, 3
7	Fuels and Energy	1, 2, 3
8	Basics of Steam Generators	1, 2
9	Basics of I.C. Engines	1, 2
10	Power Transmission Elements	1, 2

P P Savani University
School of Engineering

Department of Civil Engineering

Course Code: SECV1080
Course Name: Mechanics of Solids
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	
04	02	-	05	40	60	20	30	-	-	150

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 behavior of structural element under the influence of various loads.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction:** Definition of Rigid Body, Deformable Body, Scalar and Vector Quantities, Fundamental Principles of Mechanics: Principle of Transmissibility, Principle of Superposition, Law of Parallelogram of Forces.	03	06
2.	**Fundamental of Static:** Force, Types of Forces, Characteristics of a Force, System of Forces, Composition and Resolution of Forces. **Concurrent Forces:** Resultant of Coplanar Concurrent Force System by Analytical Method, Law of Triangle of Forces, Law of Polygon of Forces, Equilibrium Conditions for Coplanar Concurrent Forces. **Non-Concurrent Forces:** Moments & Couples, Characteristics of Moment And Couple, Varignon's Theorem, Resultant of Non-Concurrent Forces by Analytical Method, Equilibrium Conditions of Coplanar Non-Concurrent Force System.	10	22

3.	**Centroid and Centre of Gravity:** Centroid of Lines, Plane Areas and Volumes, Examples Related to Centroid of Composite Geometry, Pappus –Guldinus Theorems.	05	11
4.	**Moment of Inertia:** Parallel and Perpendicular Axis Theorems, Polar Moment of Inertia, Radius of Gyration of Areas, Examples related to moment of Inertia of Composite geometry.	5	11
Section II			
Module No.	Content	Hours	Weightage in %
5.	**Mechanical Properties of Materials:** Introduction, Classification of Materials, Properties Related to Axial, Bending, and Torsional & Shear Loading, Toughness, Hardness, Ductility, Brittleness. Proof stress, Factor of Safety, Working Stress, Load Factor.	02*	5
6.	**Simple Stress and Strain:** Definition of Stress and Strain, Tensile & Compressive Stresses: Shear and Complementary Shear Strains, Linear, Shear, Lateral, Thermal and Volumetric. Hooke's Law, Stresses and Strain in bars of Varying, Tapering & Composite Section, Principle of Superposition. Elastic Constant, Relation between Elastic Constants.	10	21
7.	**Shear Force and Bending Moment:** Introduction, Types of Loads, Supports and Beams, Shear Force, Bending Moment, Sign Conventions for Shear Force & Bending Moment. Statically Determinate Beam, Support Reactions, SFD and BMD for Concentrated Load and Uniformly Distributed Load, Uniformly Varying Load, Point of Contra- flexure.	12	24
	TOTAL	45	100

*(To be covered during lab hours)

List of Practical (Any Ten):

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

Text Book(s):

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

Reference Book(s):

Title	Author(s)	Publication
Engineering Mechanics,	Meriam and Karaige,	Wiley-India
Engineering Mechanics: Statics and Dynamics	S Rajsekaran	Vikas Publication
Engineering Mechanics of Solids	Popov E.P	Prentice Hall of India
Strength of Materials (SI Units)	Er. R . K. Rajput	S. Chand & Company Pvt. Ltd.
Mechanics of Structure-Vol.I	Dr. H.J. Shah & S. B. Junarkar	Charotar Publishing House Pvt. Ltd.
Strength of materials	R. Subramanian	Oxford Publications
Strength of materials	S. Ramamrutham	DhanpatRai Publishing
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 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test consists of 15 marks during End Semester Exam.
- Viva/Oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

SECV1080	MECHANICS OF SOLIDS
CO 1	Conceptualization of the basic principles of dynamics, equilibrium, static reactions, and internal forces in statically determined beams.
CO 2	Application of principles of statics to determine c.g and m.i of a different geometrical shape.
CO 3	Problem formulation of mechanical elements and analyze the deformation behavior for different types of loads.
CO 4	Understand the different types of stresses and strains developed in the member subjected to axial, bending, shear & torsional effects.

CO5	Generalize the physical properties of materials.

Mapping of CO with PO

SECV1080	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1										
CO 2	2	1	1									
CO 3	2	1										
CO 4	2	1		1	1							

Mapping of CO with PSO

SECV1080	PSO1	PSO2	PSO3
CO 1	3		
CO 2	3		
CO 3	3		
CO 4	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	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
6	Simple Stress and Strain	2, 4, 5
7	Shear Force and Bending Moment	3, 4, 5, 6

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SECE1010
Course Name: Basics of Computer & Programming
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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand basic components of computer system.
- identify appropriate approach to computational problems.
- develop logic building and problem solving skill.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Computer and its Architecture:** Introduction and Characteristics, Generation, Classification, Applications, Central Processing Unit, Communication between Various Units, Processor Speed, Various Input and Output Devices.	03	10
2.	**Memory and Operating Systems:** Introduction to Memory, Memory Hierarchy, Primary Memory and its Type, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning, their Merits and Demerits, Evolution of Operating System, Types and Functions of Operating Systems,	06	15
3.	**Recent Advances in Computer:** Introduction to Emerging Areas like Artificial Intelligence, IoT tools, Data Science, Sensors, 3D Printing, Automization in the field of Civil, Mechanical and Chemical.	05	10
4.	**Computer Programming Language:** Introduction to different types of Programming Languages, Flowcharts and Algorithms. Introduction to C Programming Language, Features of C, Structure of C Program, Development of Program, Types of Errors, Debugging and Tracing Execution of Program.	08	15

Section II			
Module No.	Content	Hours	Weightage in %
5.	**Constants, Variables and data Types:**	05	10
	Character Set, C tokens, Keyword, Constants and Variables, Data Types - Declaration and Initialization, User define type Declarations Typedef, Enum, Basic Input and Output Operations, Symbolic Constants		
6.	**Operators and Expression and Managing I/O operations**: Introduction to Operators and its Types, Evaluation ofExpressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity. Managing Input and Output, Reading a Character, Writing a Character, Formatted Input, Formatted Output.	07	16
7.	**Conditional statement and branching:** Decision Making & Branching: Decision Making with If & If ... Else Statements, If - Else Statements (Nested Ladder), The Switch & go - to Statements, The Ternary (?:) Operator Looping: The While Statement, The Break Statement & The Do. While Loop, The FOR Loop, Jump Within Loops - Programs.	06	12
8.	**Arrays and Strings:** Introduction to Array, One Dimensional Array, Two Dimensional Arrays, Declaring and Initializing String Variables, Arithmetic Operations on Characters, Putting Strings Together, Comparison of Two Strings, Basic String Handling Functions	05	12
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1.	Introduction to Basic Command	04
2.	Word Processing, Spreadsheets and Presentation Exercises	06
3.	Introduction to Octave Environment	04
4.	Implementation in C for conditional statement and branching Implementation of if, if...else, nested if...else and switch statements Implementation of while loop, do...while loop and for loop	06
5.	Implementation of 1-D and 2-D array	06
6.	Implementation of in built string functions, application programs of array and strings	04
	TOTAL	30

 # Use of different libraries will be covered in Practical Assignments.

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	Reema Thareja	Oxford Higher Education
Programming with C	Byron Gottfried	Tata McGraw Hill

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 per each practical. At the end of the semester, the average of the entire practical will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/test consists of 15 marks during End Semester Examination.
- Viva/Oral performance consists of 15 marks during End Semester Examination.

Course Outcome(s):

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

SECE1010	BASICS OF COMPUTER & PROGRAMMING
CO 1	Observe the different types of operating systems and its functionalities.
CO 2	Explore new emerging area in computer field.
CO 3	Apply basic principles of imperative and structural programming to solve complex problems.
CO 4	Classify the types of errors occur while running the program.

Mapping of CO with PO

SECE1010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1										
CO 2		1		2	1						2	
CO 3		3	2	1								
CO 4		1	1	1								

Mapping of CO with PSO

SECE1010	PSO1	PSO2	PSO3
CO 1	3	3	1
CO 2	3	1	3
CO 3	3	3	1
CO 4	1	3	

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

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

Module No	Content	RBT Level
1	Introduction to Computer and its Architecture	1, 2, 4
2	Memory and Operating systems	1, 2, 3
3	Recent Advances in Computer	2, 4, 5
4	Computer Programming Language	1, 2, 3, 4
5	Constants, Variables and Data Types	1, 2, 3
6	Operators and Expression in Managing I/O operations	2, 3, 6
7	Conditional statement and branching	2, 4, 5
8	Arrays and Strings	1, 2, 3, 6

SECOND YEAR B. TECH.

P P SAVANI UNIVERSITY																
SCHOOL OF ENGINEERING																
TEACHING & EXAMINATION SCHEME FOR B. TECH. MECHANICAL PROGRAMME AY:2021-22																
Sem	**Course Code**	**Course Title**	**Offered By**	**Teaching Scheme**					**Examination Scheme**							
				Contact Hours				**Credit**	**Theory**		**Practical**		**Tutorial**		**Total**
				Theory	**Practical**	**Tutorial**	**Total**		**CE**	**ESE**	**CE**	**ESE**	**CE**	**ESE**	
3	SEME2011	Engineering Thermodynamics	SH	3	0	0	3	3	40	60	0	0	0	0	100
	SEME2020	Material Science & Metallurgy	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2041	Machine Drawing	ME	0	4	0	4	2	0	0	100	0	0	0	100
	SEME2110	Casting and Joining Processes	CV	3	2	0	5	4	40	60	20	30	0	0	150
	SESH2011	Differential Equations	ME	3	0	2	5	5	40	60	0	0	0	0	100
	SECV2102	Advanced Solid Mechanics	ME	3	2	0	5	4	40	60	20	30	0	0	150
	CFLS1020	Global Communication Skills	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
	SEME2910	Industrial Exposure	ME	2			0	2	0	0	100	0	0	0	100
						Total	**29**	**26**							**950**
4	SESH2022	Numerical & Statistical Analysis	SH	3	0	2	5	5	40	60	0	0	50	0	150
	SEME2050	Forming & Machining Processes	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2060	Fluid Mechanics	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2070	Mechanical Measurement & Metrology	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2081	Kinematics of Machinery	ME	4	0	0	4	4	40	60	0	0	0	0	100
	SEME2090	Software Tools for Mechanical Engineers	ME	0	2	0	2	1	0	0	50	0	0	0	50
	CFLS3010	Foreign Language-I	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
	SEPD3040	Integrated Personality Development Course-I	SEPD	2			2	1	100	0	0	0	0	0	100
						Total	**30**	**25**							**950**

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2011

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Basic Concepts of Thermodynamic** 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.	**First and Second law of Thermodynamics** 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.	**Entropy** 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.	**Exergy** 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
	Section II		
Module No.	Content	Hours	Weightage in %
5.	**Vapour Power Cycles** Carnot vapor cycle, Rankine cycle, comparison of Carnot and Rankine cycle, carnot cycle efficiency, variables affecting efficiency of Rankine cycle.	06	15
6.	**Gas Power Cycles** 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.	**Properties of gases and gas mixtures** 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.	**Refrigeration and Liquefaction** Carnot refrigeration cycle, air refrigeration cycle, absorption refrigeration, choice of refrigeration,	04	08
	TOTAL	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	Yunus Cengel & Boles	McGraw-Hill Education

Approach		
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.

Tutorial:

- Circuits and charts for gas & vapour power cycle consists of 10 marks.
- Internal Viva consists of 10 marks.
- Viva/Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

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

SEME2011	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

SEME2011	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1										
CO 2	2	1								2		
CO 3	2	1								1		
CO 4	1	2								2		
CO 5	1	2								2		

Mapping of CO with PSO

SEME2011	PSO1	PSO2	PSO3
CO 1			

CO 2	3		
CO 3	3	3	
CO 4	3	3	
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

Department of Mechanical Engineering

Course Code: SEME2020
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	20	30	-	-	150

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Materials** 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, Bravise 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.	06	12

2.	**Phase Diagrams and Phase Transformation** Phase, Gibbs's Phase rule, Solubility and Solid Solutions, Iso-morphous alloy system, Eutectoid and Peritectic system, Evol ution of Microstructure, Phase Transformation-Temperature-Time-Transformation (TTT) and Continuous Cooling Transformation (CCT) Diagrams, Electro Microscopy.	05	10
3.	**Solidification of Metals** 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.	05	10
4.	**Heat Treatment** Annealing and its types, Normalizing, Aus-tempering, Mar-tempering, Quenching and Temper heat treatment, Hardenability, Applications of above processes for the industrial practices. **Surface hardening processes** Flame and induction hardening, Carburizing, Nitriding and Carbonitriding, Applications of above processes for the industrial practices.	04	13
5.	**Powder Metallurgy** Application and advantages, Production of powder, Compacting, Sintering, Equipment and process capability.	02	05
	Section II		
Module No.	Content	Hours	Weightage in %
6.	**Cast Iron and Alloy steel** 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.	09	20
	Non-Ferrous Alloys		

7.	Non-Ferrous Alloys of Aluminium, Magnesium, Copper, Nickel, Titanium, Microstructure and mechanical property relationships; Composite, Classification, Processing, Metal Matrix	03	05
8.	**Mechanical Behavior of Metals** Properties of metals, Deformation of metals, Mechanisms of deformation, Deformation in polycrystalline materials, Mechanical testing of materials (destructive & nondestructive) testing methods.	04	15
9.	**Polymers, Ceramics and Composites** Definition, Classification & characteristics of polymers,Types of polymerization, Polymer processing, polymer matrix, properties and applications Elastomers, Properties of ceramic materials, Cermets, Ceramic Matrix, Ceramics, Alumina, Zirconia, Silicon Carbide, Sialons, Reaction Bonded Silicon Nitride, Processing Composite materials, Fiber reinforced plastic (FRP), Glasses properties and applications.	07	10
	TOTAL	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 examinationand 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 Brineon the hardness of medium carbon steel.	04
5.	To find out the effect of varying section size on hardenability of steel andobtain hardness distribution curves of hardened steel cross-section.	04
6.	To determine machine defects by dye -penetrant test and magnetic particletest.	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 casehardening to improve properties of steel during processes and applications with the help of mufflefurnace.	04
	TOTAL	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 solution of Practical which will be evaluated out of 10 for each and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 Marks.
- Performance/Problem solution/quiz/test of 15 Marks during End Semester Exam.
- Viva/Oral performance of 15 Marks during End Semester Exam.

Course Outcome(s):

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

SEME2020	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

SEME2020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2			3	3	1				3
CO 2	2	3	2			3	3	3	2	1	1	3
CO 3	2	3	2			3	3	3	2		2	3

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

Mapping of CO with PSO

SEME2020	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
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

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2041

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	
-	04	-	02	-	-	100	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	05
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	14
8.	Parts designing using software tools	12
9.	Study of force analysis using software	15
	TOTAL	60

Text Book(s):

Title	Author/s	Publication
Machine Drawing	N. D. Bhatt, V. M. Panchal	Charotar Publishing House Pvt. Ltd.
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 and noted the same in manual and record book which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal Viva consists of 30 marks.

Course Outcome(s):

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

SEME2041	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

SEME2041	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

SEME2041	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

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	Machining Symbols and Surface Roughness	1, 2
2	Limit, Fits and Tolerances	1, 2, 3
3	Screw Threads	1, 2, 5
4	Screwed Fastening	1, 2, 5
5	Keys, Cotter and Pin Joint	2, 4, 5
6	Riveted Joints, Bolted Joints, Welding Joints and WeldingSymbols	2, 4, 5
7	Drafting Software	1, 2, 5, 6

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2101

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	100	00	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	05
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	14
8.	Parts designing using software tools	12
9.	Study of force analysis using software	15
	TOTAL	60

Text Book(s):

Title	Author/s	Publication
Machine Drawing	N. D. Bhatt, V. M. Panchal	Charotar Publishing House Pvt. Ltd.
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 and noted the same in manual and record book which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal Viva consists of 30 marks.

Course Outcome(s):

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

SEME2101	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

SEME2101	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

SEME211	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

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

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2110

Course Name: Casting & Joining Process

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	20	30	-	-	150

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Manufacturing Processes** Basic Introduction, Economics and Technological Definition, Importance of Manufacturing, Classification and Selection of Manufacturing Processes.	02	05
2.	**Patternmaking and Foundry** 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.	**Miscellaneous Casting Process** Shell moulding, Die casting, investment Casting, Carbon dioxide molding process, Centrifugal casting, Slush casting, Continuous casting process, Advanced technologies in casting.	08	20%

Section II			
Module	Content	Hours	Weightage in %
4.	**Gas Welding** 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	18%
5.	**Electric Arc Welding** 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.	08	18%
6.	**Resistance Welding** 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.	07	14%
	TOTAL	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
	TOTAL	30

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 will be evaluated out of 10 for each practical and average of the same will be converted to 10 marks.
- Internal Viva component of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME2110	CASTING AND JOINING PROCESS
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

SEME2110	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2				1						2	
CO 2	2				3		3					2

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

Mapping of CO with PSO

SEME2110	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	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

P P Savani University

School of Engineering

Department of Science & Humanities

Course Code: SESH2011

Course Name: Differential Equations

Prerequisite Course(s): SESH1010-Elementary Mathematics for Engineers

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	-	-	50	-	150

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 involving differential equations.
- understand the introduction of partial differential equations with methods of its solutions.
- learn the application of Laplace transforms to solve linear differential equations.
- understand the introduction of periodic functions and Fourier series with their applications for solving ODEs.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Ordinary Differential Equation** First order ODEs, Formation of differential equations, Solution of differential equation, Solution of equations in separable form, Exact first order ODEs, Linear first order ODEs, Bernoulli Equation, ODEs of Second and Higher order, Homogeneous linear ODEs, Linear Dependence and Independence of Solutions, Homogeneous linear ODEs with constant coefficients, Differential Operators Nonhomogeneous ODEs, Undetermined Coefficients, Variation of Parameters	10	20
2.	**Partial Differential Equation** Formation of First and Second order equations, Solution of First order equations, Linear and Non-liner equations of first, Higher order equations with constant coefficients, Complementary	7	18

	function, Particular Integrals.		

Section II			
Module No.	Content	Hours	Weightage in %
3.	**Laplace Transform** Laplace Transform, Linearity, First Shifting Theorem, Existence Theorem, Transforms of Derivatives and Integrals, Unit Step Function, Second Shifting Theorem, Dirac's Delta function, Laplace Transformation of Periodic function, Inverse Laplace transform, Convolution, Integral Equations, Differentiation and Integrations of Transforms, Application to System of Differential Equation.	10	20
4.	**Fourier Series** Periodic function, Euler Formula, Arbitrary Period, Even andOdd function, Half-Range Expansions, Applications to ODEs.	7	15
5.	**Fourier Integral and Transformation** Representation by Fourier Integral, Fourier Cosine Integral, Fourier Sine Integral, Fourier Cosine Transform and Sine Transform, Linearity, Fourier Transform of Derivatives.	6	15
	TOTAL	45	100

List of Tutorials:

Sr No	Name of Tutorial	Hours
1.	Ordinary Differential Equation-1	2
2.	Ordinary Differential Equation-2	2
3.	Ordinary Differential Equation-3	4
4.	Partial Differential Equation-1	2
5.	Partial Differential Equation-2	4
6.	Applications of ODE and PDE	2
7.	Laplace Transform-1	2
8.	Laplace Transform-2	2
9.	Laplace Transform-3	4
10.	Fourier Series-1	2
11.	Fourier Series-2	2
12.	Fourier Integral and Transformation	2

		TOTAL	30

Text Book(s):

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

Reference Book(s):

Title	Author/s	Publication
Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers
Advanced Engineering Mathematics	R. K. Jain, S.R.K. Iyengar	Narosa Publishing House Pvt. Ltd.
Differential Equations for Dummies	Steven Holzner	Wiley India Pvt. Ltd.
Higher Engineering Mathematics	H.K. Dass, Er. Rajnish Verma	S. Chand & Company Pvt. Ltd.

Web Material Links:

- http://nptel.ac.in/courses/111105035/
- http://nptel.ac.in/courses/111106100/
- http://nptel.ac.in/courses/111105093/
- http://nptel.ac.in/courses/111108081/

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 30 Marks.
- MCQ based examination consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

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

SESH2011	DIFFERENTIAL EQUATIONS
CO1	Describe 1st and 2nd order ODEs and PDEs.
CO2	Classify differential equations and evaluate linear and non linear partial differential equations.
CO3	Illustrate engineering problems (growth, decay, flow, spring and series/parallel electronic circuits) using 1st and 2nd order ode.

CO4	Apply laplace transform as a tool which are used to evaluate differential equation and fourier integral representation.
CO5	Examine the various tests of power series and fourier series for learning engineering.

Mapping of CO with PO

SESH2011	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	1	1								1
CO 2	3	1	1	1								1
CO 3	3	2	1	1								1
CO 4	3	1	1	1								1
CO 5	3	1	1	1								1

Mapping of CO with PSO

SESH2011	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	2	1	
CO 3	2	1	
CO 4	2	1	
CO 5	2	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	Ordinary Differential Equation	1, 2, 3, 5
2	Partial Differential Equation	1, 2, 4, 5
3	Application of ODE and PDE	1, 2, 4, 5, 6
4	Laplace Transform	1, 2, 3, 5
5	Fourier Series	1, 2, 3, 5
6	Fourier Integral and Transformation	1, 2, 3, 4

P P Savani University

School of Engineering

Department of Civil Engineering

Course Code: SECV2102

Course Name: Advanced Solid Mechanics

Prerequisite Course(s): Engineering Mechanics (SECV1030), Solid Mechanics (SECV1070)/Mechanics of Solids (SECV1080)

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to understand

- the stresses developed under the application of force.
- the effect of torsion on material.
- behavior of structural element under the influence of various stresses.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Bending Stress in Beam** Theory of simple bending, Assumptions, Derivation of flexural formula, Position of Neutral axis, Section modulus, Second moment of area of common cross sections (rectangular, I,T,C) with respective centroid & parallel axes, Bending stress distribution diagrams,	08	18
2.	**Shear Stress in Beam** Shearing stresses at a section, Derivations of shear stress distribution formula for different sections, shear stress distribution diagrams for common symmetrical sections,Maximum and average shears stresses, Shear connection between flange & web.	08	18
3.	**Direct & Bending Stress** Eccentric loading, Symmetrical column with eccentric loading about one axis, Symmetrical columns with Eccentric loading about two axis, Unsymmetrical columns with Eccentric loading.	07	14

Section II			
Module No.	Content	Hours	Weightage in %
4.	**Dams** Introduction, Types of dams, Rectangular dam, Stress across the section of the dam, Trapezoidal dam, stability of dam.	08	18
5.	**Column & Strut** Introduction, Failure of a column, Assumptions in Eural's Theory, End conditions for long column, Expression for crippling load when both ends of the column are hinges, Expression for crippling load when both ends of the column are Fixed, Expression for crippling load when both ends of thecolumn are Free, Expression for crippling load when one end of the column is fixed and other is hinged, Effective length of column, Limitations of Eural's formula, Rankine's formula.	07	16
6.	**Torsion** Derivation of equation of torsion, Assumptions, Application of theory of torsion equation to solid & hollow circular shaft, Torsional rigidity, Power Transmitted by shaft, Polar moment of Inertia.	07	16
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Torsion Test	02
2.	Fatigue Test	02
3.	Tutorials on Bending Stress in Beam	04
4.	Tutorials on Shear Stress in Beam	04
5.	Tutorials on Direct and Bending Stress, Torsion	04
6.	Tutorials on Dam	06
7.	Tutorials on Column & Strut	04
8.	Tutorials on Torsion	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Strength of Materials (SI Units)	Dr. R. K. Bansal	Laxmi Prakashan

Reference Book(s):

Title	Author/s	Publication
Strength of Materials (SI Units)	R. S. Khurmi	S. Chand & Company Pvt. Ltd.
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	Dhanpat Rai Publishing Company

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test consists of 15 marks during End Semester Exam.
- Viva/ Oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

SECV2102	**ADVANCED SOLID MECHANICS**
CO1	Apply mathematical knowledge to calculate the deformation behavior of simple structure.
CO2	Analyze the critical problems and solve the problem related to mechanical elements and analyze the deformation behavior for different types of loads.
CO3	Perceive the different types of stresses and strains developed in the member subjected to axial, bending, shear & torsional effects.
CO4	Apprehension of the physical properties of materials.
CO 5	Study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.

Mapping of CO with PO

SECV2102	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	3	3							3
CO 2	3	3	3	3	3							3
CO 3	3	3	3	3	3							3
CO 4		3	3	3	3							3
CO 5	3	3	3	3	3							3

Mapping of CO with PSO

SECV2102	PSO1	PSO2	PSO3
CO 1	3	2	
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	

CO 5	3	2	

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

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

Module No	Content	RBT Level
1	Bending Stress in Beam	1, 2, 3
2	Shear Stress in Beam	2, 3, 4
3	Direct & Bending Stress	2, 4, 5
4	Dams	3, 4, 5
5	Column & Strut	1, 2, 5, 6
6	Torsion	2, 4, 5

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2910

Course Name: Industrial Exposure

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	
-	02	-	02	-	-	100	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective of the Course:

To help learners to

- get exposed to the industrial spectrum.
- learn the mechanisms of industry/ workplace.
- be aware about work culture and policies of industries.

Outline of the Course:

Sr. No	Content
1.	Selection of Companies
2.	Company Information collection
3.	Report Writing
4.	Presentation & Question-Answer

Course Evaluation:

Sr. No.	Evaluation criteria	Marks
1	Actual work carried & Report Submission	50
2	Final Presentation & Question-Answer session	50
	Grand Total:	**100**

Course Outcome:

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

- get acquainted with the industrial scenario.
- be aware about his future prospects in the respective field.
- gain knowledge of work culture and industrial expectations.

Report Writing Guidelines

A. Report Format:

1. Title Page (to be provided by the respective supervisor)

The title page of the project shall give the following information in the order listed:

- Full title of the project as approved by the Mentor;
- The full name of the student/Group of students with enrollment number;
- The qualification for which the project is submitted;
- The name of the institution to which the project is submitted;
- The month and year of submission.

2. Project Certification Form

[The form should be duly filled signed by the supervisors.]

3. Acknowledgements

[All persons (e.g. supervisor, technician, friends, and relatives) and organization/authorities who/which have helped in the preparation of the report shall be acknowledged.]

4. Table of Contents/Index with page numbering
5. List of Tables, Figures, Schemes
6. Summary/abstract of the report.
7. Introduction/Objectives of the identified problem
8. Data Analysis and Finding of Solution
9. Application of the identified solution
10. Future Scope of enhancement of the Project and Conclusion
11. "Learning during Project Work", i.e. "Experience of Journey during Project Duration"
12. References(must)
13. Bibliography
14. Annexures (if any)

B. Guideline for Report Formatting:

- Use A4 size page with 1" margin all sides
- Header should include Project title and footer should contain page number and enrollment numbers
- Chapter Name should be of Cambria font, 20 points, Bold
- Main Heading should be of Cambria font, 14 points, Bold
- Sub Heading should be of Cambria font, 12 points, Bold
- Sub Heading of sub heading should be of Cambria font, 12 points, Bold, Italic
- Paragraph should be of Cambria font, 12 points, no margin at the start of the paragraph
- Line spacing for all content – 1.15, before - 0, after - 0
- No chapter number for references
- Before chapter 1, give page numbers in roman letter

Course Outcome(s):

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

SEME2910	**INDUSTRIAL EXPOSURE**
CO1	Construct company profile by compiling brief history, management structure, products/services offered, key achievements and market performance for the company visited during internship.

CO2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
CO5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO

SEME2910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1			1	1	3		2	3	3	3	3	3
CO 2			1	1	3		2	3	3	3	3	3
CO 3	1		1	1	3		2	3	3	3	3	3
CO 4			1	1	3		2	3	3	3	3	3
CO 5			1	1	3		2	3	3	3	3	3

Mapping of CO with PSO

SEME2910	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

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

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

Module No	**Content**	**RBT Level**
1	Selection of Companies	1, 2
2	Company Information collection	1, 2, 3
3	Report Writing	1, 2, 3, 4
4	Presentation & Question-Answer	1

P P Savani University

School of Engineering

Department of Science & Humanities

Course Code: SESH2022

Course Name: Numerical & Statistical Analysis

Prerequisite Course(s): SESH1020-Linear Algebra & Vector Calculus,
SESH2011-Differential Equations
SESH2031-Differential Methods for Chemical Engineers

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	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

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

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Complex Variables** Complex numbers with operators and geometric representation, Analytic function, Derivative of complexfunction, Cauchy-Riemann equation, Trigonometric and Hyperbolic functions, Complex Integration, Conformal Mapping, Linear functional transformations, Cauchy's Integral, Calculation of residue	10	20
2.	**Numerical Solutions of Linear and Non-linear Equations** Errors and Their computations, General error formula, Bisection Method, Iteration Method, Newton-Raphson Method, Solution of system of non-linear equation, Solution of linear system, Gauss Elimination	06	13

	Trapezoidal Rule, Simpson's 1/3-rule, Simpson's 3/8-rule, Euler-Maclaurin Formulae		
Section II			
Module	Content	Hours	Weightage in %
4.	**Basics of Statistics** Elements, Variables, Observations, Quantitative and Qualitative data, Cross-sectional and Time series data, Frequency distribution, Dot plot, Histogram, Cumulative distribution, Measure of location, Mean, Median, Mode, Percentile, Quartile, Measure of variability, Range, Interquartile Range, Variance, Standard Deviation, Coefficient of Variation, Regression Analysis, Regression line and regression coefficient, Karl Pearson's method.	07	15
5.	**Probability Distribution** Introduction, Conditional probability, Independent events, independent experiments, Theorem of total probability and Bayes' theorem, Probability distribution, Binomial distribution, Poisson distribution, Uniform distribution, Normal distribution.	08	18
6.	**Testing of Hypothesis** Introduction, Sampling, Tests of significance for parametric test, Null Hypothesis, Type 1 and Type 2 errors, Level ofsignificance, hi-square test, Student's t-test, Seducer's f-test	07	17
	TOTAL	45	100
3.	**Numerical Differentiation and Integration** Interpolation, Finite Differences, Error in numerical differentiation, Cubic Splines Method, Differentiation Formulae, Numerical solution of ODEs, Picard's Method, Euler's Method, Runge-Kutta Method, Numerical Integration,	07	17

List of Tutorials:

Sr No	Name of Tutorial	Hours
1.	Complex Variables-1	4
2.	Complex Variables-2	2
3.	Numerical Solutions of Linear and Non-linear Equations-1	2
4.	Numerical Solutions of Linear and Non-linear Equations-2	4
5.	Numerical Differentiation and Integration-1	2
6.	Numerical Differentiation and Integration-2	2
7.	Basics of Statistics-1	2
8.	Basics of Statistics-2	4
9.	Probability-1	2
10.	Probability-2	2
11.	Testing of Hypothesis-1	2
12.	Testing of Hypothesis-2	2
	TOTAL	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
Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers, New Delhi
Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyengar	Narosa Publishing House, New Delhi
Introductory Methods of Numerical Analysis	S. S. Sastry	PHI Learning Pvt. Ltd. New Delhi

Web Material Links:

- http://nptel.ac.in/courses/111106094/
- http://nptel.ac.in/courses/111106084/
- http://nptel.ac.in/courses/111105035/
- http://nptel.ac.in/courses/111101003/
- http://nptel.ac.in/courses/111105090/

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 30 marks.
- MCQ based examination consists of 10 Marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

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

SESH2022	NUMERICAL & STATISTICAL ANALYSIS
CO 1	Derive numerical solution of linear and non linear system of equation.
CO 2	Apply probability in decision making, artificial intelligence, machine learning etc.
CO 3	Construct different statistical methods to collect, compare, interpret & evaluate data.
CO 4	Acquire knowledge of finite differences, interpolation, numerical differentiation and numerical integration.

Mapping of CO with PO

SESH2022	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	1	1								1
CO 2	3	2	1	2								1
CO 3	3	2	1	1								1
CO 4	3	2	1	1								1

Mapping of CO with PSO

SESH2022	PSO1	PSO2	PSO3
CO 1		2	
CO 2		2	
CO 3		2	
CO 4		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	Complex variables	1, 2, 3, 4, 6
2	Numerical Solutions of Linear and Non-Linear Equations	1, 2, 3, 5

3	Numerical Differentiation and Integration	1, 2, 3, 5
4	Basics of Statistics	1, 2, 3, 4, 5
5	Probability Distribution	1, 2, 3, 4, 5
6	Testing of Hypothesis	1, 2, 3, 5, 6

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2050

Course Name: Forming and Machining Processes

Prerequisite Course(s): -- SEME2110 – Casting & Joining Processes, 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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- understand the basic operation involved in various machines.
- understand the machining science using conventional machines.

Course Content:

Section I			
Module	Content	Hours	Weightage in %
1.	**Mechanical working of Metals** Introduction, Classification of Forming Processes, Mechanics ofMetal Working, Various Temperatures in Metal Working, Cold and Hot Working, Formability, Strain Rate Effects on metal forming, Effects of Metallurgical Structure on Metal Forming, NHydro Static Pressure, Residual Stresses.	07	16
2.	**Metal Rolling** Introduction and classification of Rolling processes, Principles of Metal Rolling, Simplified Analysis of Rolling Load, Various Rolling Parameters, Defects in rolled products and remedies of it.	03	07
3.	**Forging** Introduction and classification of Forging Processes, Various Forging operations, Forging Die Materials and Lubrication, Forge ability, Forging, Defects and remedies.	04	08

4.	**Extrusion** Introduction and classification of Extrusion Processes, Various Extrusion Operations, Metal Deformation and Forces in Extrusion. Materials and Lubrication considerations in Extrusion Process, Extrusion Defects, Extrusion of Tubing,	05	12
	Production of Seamless Pipe and Tubing. Drawing of Rods, Wires and Tubes, Sizing**.**		
5.	**Press Working and Dies** Types of presses drive and feed mechanisms, press tools. Various press working operations and its parameters, Elements of press, Various Metal Forming Operations. Stock strip layout, study of sheet metal nesting software.	**03**	**07**
	Section II		
Module No.	Content	Hours	Weightage in %
6.	**Turning Machine** Engine Lathes, Construction, Arrangement and Principle, Units of engine lathes, Type and size range of engine lathes; Operations carried on engine lathe, Attachment extending the processing capacities of engine lathes; Description of other types of lathes, Plain turning lathes, Facing lathes, Multiple tool lathes; Simple purpose lathes, Turret lathes, Horizontal and Vertical lathes.	08	17
7.	**Milling Machines** Purpose and types of milling machines, general purpose milling machines. Different types of milling operations. Milling cutters, attachments extending the processing capabilities of general purpose milling machines.	06	15
8.	**Planers, Shapers and Slotters** Classification, Attachments extending the processing capacities of each.	03	06
9.	**Sawing and Broaching Machines** Metal sawing – classification; Reciprocating sawing machines, Circular sawing machines, Band sawing machines. Types of broaching machines, Advantages and Limitations of Broaching.	02	04
10.	**Drilling, Boring, Grinding Machines and Abrasives** Application of drilling and boring machines. Upright drill processes, radial drills, Horizontal and Precision Boring Machines. Classifications of grinding machines, Cylindrical grinders, Internal grinders, Surface grinders, Tool and Cutter grinders. Surface finishing, Abrasives,	04	08

	Manufacture of grinding wheels.		
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	Rolling Operation Using Three Roller Bending Machine	02
2.	Forging Operation	02
3.	Bending Operation Using Hydraulic Pipe Bender	02
4.	Press and Press Working Operations	04
5.	Turning practices for Step turning and thread cutting	06
6.	Capstan and Turret Lathe	02
7.	Spur Gear Cutting on Milling Machine	04
8.	Planers, Shapers and Slotters Machine	04
9.	Drilling machine	02
10.	Grinding machine	02

Text Book(s):

Title	Author/s	Publication
Manufacturing Processes vol I	O.P. Khanna	Dhanpatrai Publication
Workshop Technology Vol. I, II & III	WAJ Chapman	Elseveir

Reference Book(s):

Title	Author/s	Publication
Workshop Technology Vol. II	Hajra & Choudhari	Media promoters & publishers pvt. Ltd.
Metal Cutting Principles, 2E	Shaw	Oxford
A Textbook of Production Technology	Sharma P.C.	S Chand

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 10 marks.

- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME2050	FORMING AND MACHINING PROCESS
CO1	Memorize and apply techniques involved in various metal forming processes.
CO2	Identify machining operations and tools to create work products.
CO3	Apply and generate sequence of machining operation for better manufacturing practices.
CO4	Ability to identify, formulate, and solve engineering & real-life problems.

Mapping of CO with PO

SEME2050	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1									
CO 2	2		1		1		1	1			1	
CO 3	2		1	1			1	1	1			
CO 4	2	1	1	1	1		1	1		1		

Mapping of CO with PSO

SEME2050	PSO1	PSO2	PSO3
CO 1	1	3	
CO 2	1	1	2
CO 3	3	3	1
CO 4		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	Mechanical Working of Metals	1, 2, 5, 6
2	Metal Rolling	1, 2, 5, 6
3	Forging	1, 2, 5, 6
4	Extrusion	1, 2, 5, 6
5	Press Working and Dies	2, 6
6	Turning Machine	2, 4, 5, 6

7	Milling Machine	2, 4, 5, 6
8	Planers, Shapers and Slotters	2, 6
9	Sawing and Broaching Machines	2, 6
10	Drilling, Boring, Grinding Machines and Abrasives	2, 5, 6

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2060

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	20	30	-	-	150

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Properties of Fluids** Density, Viscosity, Surface Tension, Compressibility, Capillary, Vapour Pressure, Bulk Modulus, Cavitation, Classification of Fluids	02	5
2.	**Fluid Statics** 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.	07	15
3.	**Fluid Kinematics** Steady and Unsteady Flow, One – two and three DimensionalFlow,	07	15

	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		
4.	**Fluid Dynamics** Newton's law of motion, Euler's Equation and its applications, Bernoulli's Equation and its applications, Momentum Equation, Pitot Tube, Determination of volumetric flow with pitot tube, Principle of Venturimeter, Pipe Orifice and Rotameter.	06	15
Section II			
Module No.	Content	Hours	Weightage in %
5.	**Dimensional Analysis** Dimensions, Dimensional Homogeneity, Raleigh and Buckingham π Theorem, Non-Dimensional Numbers, Similarities – Geometrical, Kinematics and Dynamic.	05	10
6.	**Flow Through Pipes & Open Channels** 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, Dracy Weishbach Equation, Types of open channel flow, Specific Energy and Specific Force, Critical Flow, Hydraulic Jump, Measurement of Discharge in open Channels.	09	20
7.	**Viscous Flow** 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.	05	10
8.	**Boundary Layer Theory** Concept of Boundary Layer, Boundary layer Thickness, Momentum Thickness, Displacement Thickness, Drag and Lift, Separation of Boundary layer, Streamlined and Bluffed Bodies.	04	10
	TOTAL	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
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications
Introduction to Fluid Mechanics and Fluid Machines	S.K.Som & Biswas.G	Tata McGraw Hill Publication

Reference Book(s):

Title	Author/s	Publication
Fluid Mechanics	Frank M. White	Tata McGraw Hill Publication
Fluid Mechanics	R.K.Rajput	Schand 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 15 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 10 marks during End Semester Exam.

Course Outcome(s):

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

SEME2060	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

SEME2060	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2			2					3			
CO 2	3	2	2	3					3			
CO 3	3	2		3					3			
CO 4	3	3		3					3			
CO 5	3	1		3					3			

Mapping of CO with PSO

SEME2060	PSO1	PSO2	PSO3
CO 1		2	
CO 2	3	3	
CO 3	3	3	
CO 4	3	3	
CO 5		2	

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

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

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

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2070

Course Name: Mechanical Measurement and 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	20	30	-	-	150

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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Principles of Metrology** Concept of Metrology, Need for inspection, Linearity, Repeatability, Sensitivity and readability, Precision & Accuracy, Standards of measurements.	02	05
2.	**Screw threads and gear Metrology** 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.	**Surface Roughness Metrology** Introduction, Surface Texture, Methods of Measuring Surface finish,	04	09

	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.	**Straightness, Flatness, Squareness, Parallelism and Machine Tool Tests** 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	12
5.	**Miscellaneous Metrology** Measurement of Force, Torque, Power, Measurement of displacement, Velocity and Acceleration, Measurement of Speed and Frequency	04	09
	Section II		
Module No.	Content	Hours	Weightage in %
6.	**Measurement Concept** 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	04	09
7.	**Linear Measurements** 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.	**Angular and Taper Measurements** 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	09
9.	**Temperature measurement** Temperature scales, Temperature measuring devices, Methods of Temperature Measurement, Expansion Thermometers; Filled System thermometers; Electrical Temperature Measuring Instrument, Pyrometers; Calibration of Temperature Measuring Instruments.	04	09

10.	**Inspection Technologies** History of Coordinate Measuring Machines, Important feature of CMM, CMM construction, CMM Operation and Programming, Performance of CMM, Possible causes of errors in CMM, Trigger type and Measuring type probes in computer controlled CMM, Accuracy Specification for CMM, Calibration of CMM, CMM Applications and Benefits, Role of computer in field of Metrology	04	09
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
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)	-
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Textbook Of Metrology	M. Mahajan	Dhanpat rai & Co.
Mechanical Measurements & Control	D. S. Kumar	Metropolitan books co pvt ltd

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

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 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME2070	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

SEME2070	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2				1						2	
CO 2	2				3		3					2
CO 3	2				2		3		2			2
CO 4	2				3		3	1	2			2
CO 5	2				3		3	1	2			2

Mapping of CO with PSO

SEME2070	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: SEME2081

Course Name: Kinematics of Machinery

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	
04	-	-	04	40	60	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help the leaners 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:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Basics of Mechanisms** 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 ofslider crank chain, Synthesis of Mechanism, Double slider- crank chain, Quick return mechanism, Limiting Positions and Mechanical Advantage.	06	10
2.	**Velocity Analysis** 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,	12	20

	Velocity diagrams.		
3.	**Acceleration Analysis** Definition of acceleration, Angular acceleration, A general case of acceleration, Radial and transverse components ofacceleration, The coriolis component of acceleration, Examples of acceleration analysis, Acceleration diagrams.	12	20
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Kinematics of Belts, Ropes and Chain Drives** 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	10
5.	**Kinematics of Gears** 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	20
6.	**Kinematics of Cams** Introduction, Types of cams, Types of followers, Cam terminology, Displacement diagrams, Motions of the follower, Graphical construction of cam profile, High Speed CAM.	08	20
	TOTAL	60	100

Text Book(s):

Title	Author/s	Publication
Theory of Machines	S. S. Rattan	Tata McGraw Hill Education
Theory of Machines and Mechanisms	John J. Uicker, Gordon R. Pennock, Joseph E. Shigley	Oxford University Press

Reference Book(s):

Title	Author/s	Publication
Mechanism and Machine Theory	J.S Rao, R.V Dukkipati	Wiley Eastern Ltd.

Theory of Mechanism and Machine	Ghosh A., Malick A.K	East-West Pvt. Ltd.

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 Tutorial which should be evaluated out of 10 marks for each Tutorial and average of the same will be converted to 10 marks.
- Internal Viva consists of 20 marks.
- Model of any mechanism having weightage of 10 marks.
- Problem Solution/Quiz of 10 marks during End Semester Exam.

Course Outcome(s):

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

SEME2081	KINEMATICS OF MACHINERY
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, chains, and gear drives 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

SEME2081	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1										
CO 2	1	1		1	1							
CO 3	1	1			1							
CO 4	1	1		1								
CO 5	1	1		1	1							

Mapping of CO with PSO

SEME2081	PSO1	PSO2	PSO3
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

Module No	Content	RBT Level
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

P P Savani University

School of Engineering

Department of Mechanical Engineering

Course Code: SEME2090

Course Name: Software Tools for Mechanical Engineers

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	
-	02	-	01	-	-	50	-	-	-	50

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- understand the basics of mechanical software in engineering application.
- learn to use the tools of drafting software.
- explain the stress-strain analysis theory using simulation software.
- understand components of automation software and its industrial use.
- Learn to write the report and present work done.

List of Practical/Exercise(s):

Sr. No	List of Practical/Exercises	Hours
1.	Understanding the basic details of mechanical software.	02
2.	Development of different surface.	02
3.	Selection of planes	02
4.	Preparation of assembly drawings in drafting software.	04
5.	Preparation of threads, studs, fasteners	02
6.	Assembling of section.	02
7.	Preparation of different beam section.	02
8.	Analysis of loading and unloading factors at different position of prepared beam (Bending moment, longitudinal stress, torsional stress etc based on different selected factors)	04
9.	Preparation of drilling tools, lathe tool, broaching tools and its simulation.	04
10.	Understanding computational fluid dynamics on ANSYS/ COMSOL	06
	TOTAL	30

Course Evaluation:

Practical:

- Continuous Evaluation consists of performance of practical and noted the same in the manual and record book which should be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 30 marks.

Course Outcome(s):

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

SEME2090	SOFTWARE TOOLS FOR MECHANICAL ENGINEERS
CO 1	Apply skills and modern engineering tools for solving engineering problem.
CO 2	Identify and understand importance of automation software.
CO 3	Acquire knowledge about stress strain theory using simulation software.
CO 4	Develop the idea of identifying, analyzing and designing tools based on automation software.

Mapping of CO with PO

SEME2090	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	3	3	3		3	1	3	1	3
CO 2	2	3	3	3	3	3				2		3
CO 3	3	3	3	3	3	3		3	1	3		3
CO 4	2	3	3	3	3	3				3		3

Mapping of CO with PSO

SEME2090	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	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	Understanding the basic details of mechanical software.	1,2,3
2	Development of different surface.	1,2, 3, 4
3	Selection of planes	1,2, 3, 4
4	Preparation of assembly drawings in drafting software.	1, 2,3,4,5
5	Preparation of threads, studs, fasteners	1,2,3,4
6	Assembling of section.	1,2,3,4
7	Preparation of different beam section.	1,2,3,4

8	Analysis of loading and unloading factors at different position of prepared beam (Bending moment, longitudinal stress, torsional stress etc based ondifferent selected factors)	1,2,3,4,5
9	Preparation of drilling tools, lathe tool, broaching tools and its simulation.	1,2,3,4,5
10	Understanding computational fluid dynamics on ANSYS/ COMSOL	1,2,3,4,5

THIRD YEAR B. TECH.

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
TEACHING & EXAMINATION SCHEME FOR B. TECH. MECHANICAL PROGRAMME AY:2021-22															
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**	
5	SEME3111	Heat & Mass Transfer	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME3021	Fluid Machines	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME3031	Dynamics of Machinery	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME3051	Production Technology	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME3090	Industrial Engineering	ME	3	0	0	3	3	40	60	0	0	0	0	100
	CFLS3021	Foreign Language-II	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
	SEME3910	Summer Training	ME	4			4	4	0	0	100	0	0	0	100
	SEPD3050	Integrated Personality Development Course - II	SEPD	2	0	0		1	100	0	0	0	0	0	100
		Elective-I		3	0	0	3	3	40	60	0	0	0	0	100
						Total	**30**	**29**							**1100**
6	SEME3140	Design of Machine Elements	ME	3	0	1	4	4	40	60	0	0	50	0	150
	SEME3121	Internal Combustion Engines	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3080	Computer Aided Design & Manufacturing	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME3130	HVAC Systems	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3101	Power Plant Engineering	ME	3	0	1	4	4	40	60	0	0	50	0	150
	SEPD3020	Corporate Grooming & Etiquette	SEPD	1	2	0	3	2	0	0	50	50	0	0	100
	SEME3490	**Online NPTEL Course**		3	0	0	3	3	100	0	0	0	0	0	100
						Total	**27**	**23**							**950**

ELECTIVE-I COURSES															
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**	
5	SEME3591	Fuels & Combustion	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3620	Production Management	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3530	Cost Estimation for Engineers	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3610	Product Development & Value Engineering	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3602	Gas Dynamics	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3560	Industrial Maintenance & Safety	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3570	Mechatronics	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3581	Plastics, Ceramics & Composites	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3541	Design of Pressure Vessel & Piping	ME	3	0	0	3	3	40	60	0	0	0	0	100

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3111
Course Name: Heat & Mass Transfer
Prerequisite Course(s): SEME2011-Engineering Thermodynamics

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- introduce and explain basic concept, principles and modes of heat transfer.
- calculate basis calculation based on heat transfer in various applications.
- calculate basis calculation applied in heat exchanger design.
- learn about analysis and design aspects in various engineering systems related to conduction, convection and radiation heat transfer.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Modes of Heat Transfer – Conduction; Convection and Radiation, Thermal Conductivity, Effect of temperature on thermal conductivity, derivation of generalized equation in Cartesian, cylindrical and spherical coordinates and its reduction to specific cases, General Laws of Heat Transfer.	04	09
2.	**Steady State Heat Conduction** Fourier's Law, One Dimensional Steady State Conduction through Plane and Composite Wall; Plane and Composite Cylinder; Plane and Composite Sphere, Critical Radius of Insulation for Cylinder and Sphere, Overall Heat Transfer Co-efficient.	06	13
3.	**Unsteady State Heat Conduction (Trasient)** Lumped Parameter Analysis, Transient Heat Conduction in solids with finite conduction and convection resistances.	06	14
4.	**Heat Transfer from Extended Surfaces (Fins)** Types of Fins, Heat Transfer through Rectangular Fins, Infinitely Long Fins, Fins Insulated at tip and fins losing the heat from the tip, Efficiency and Effectiveness of Rectangular Fins, Biot Number	06	14
Section II			

Module No.	Content	Hours	Weightage in %
5.	**Forced and Free Convection** Newton's Law of Cooling, Dimensional Analysis applied for free and forced convection, Dimensionless Numbers and their physical significance, Energy integral equation of the boundary layer on a flat plate for forced convection, Empirical Correlations and their uses for free and forced convection, Thermal and Hydro Dynamic Boundary layer, Free Convection from vertical flat plate, Blasius Solution, General Solution for Von-Karman integral momentum equation.	08	17
6.	**Radiation** Absorptivity, Reflectivity and Transmissivity; Black, Grey and White Body; Emissivity and Emissive Power; Laws of Radiation – Planck's, Kirchoff's, Stefan Boltzmann, Wein's Displacement Law; Lambert Cosine Law; Radiation Shape Factor; Heat radiate between black bodies; Heat radiate between non black bodies, parallel plates and infinite long cylinders.	06	13
7.	**Heat Exchangers** Classification, Heat Exchanger Analysis, LMTD and e-NTU for parallel and counter flow heat exchanger, Fouling Factor, Correction Factor for Multi passes arrangements, Introduction of Heat Pipe and Compact Heat Exchanger.	06	13
8.	**Two Phase Heat Transfer** Fundamentals of Boiling and Condensation, Pool Boiling and its types, Condensation of vapour, Film wise and Drop wise condensation.	03	07
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	Thermal Conductivity of Composite Wall	02
2.	Thermal Conductivity of Insulating Powder	02
3.	Heat Transfer from a Pin Fin	02
4.	Heat Transfer by Unsteady state conduction	04
5.	Heat Transfer by Free Convection	04
6.	Heat Transfer by Forced Convection	04
7.	Measurement of Emissivity	02
8.	Measurement of Stefan Boltzmann Constant	02
9.	Heat Transfer in Tubular (Parallel and Counter Flow) Heat Exchanger	04
10.	Heat Transfer in Plate Heat Exchanger	02
11.	Critical radius of insulation.	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Heat and Mass Transfer	Yunus A Cengen, Afshin J Ghajar	McGraw Hill Eduction
Heat Transfer	P K Nag	McGraw Hill Publication

Reference Book(s):

Title	Author/s	Publication
Heat and Mass Transfer	R K Rajput	S Chand Publication
Heat and Mass Transfer	D S Kumar	KATSON Books

Web Material Link(s):

- https://nptel.ac.in/downloads/112108149/

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be considered.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3111	HEAT & MASS TRANSFER
CO1	Describe classify the heat transfer problems and to apply the principles of steady state one dimensional heat transfer, extended surface and unsteady state conduction for commonly encountered mechanical engineering problems.
CO2	Identify the type of convection problems and to apply concepts of natural and forced convection for related problems.
CO3	Adapt LMTD and effectiveness NTU method for simple heat exchange devices.
CO4	Integrate heat transfer principles to analyse various engineering applications.
CO5	Explain various laws of radiation heat transfer and to compute the radiation heat transfer between black and grey surfaces of simple mechanical systems.

Mapping of CO with PO

SEME3111	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2		3					3	3		
CO 2	3	2		3					3	3		
CO 3	2	2	2	3					3	3		
CO 4	3	2		3					3	3		
CO 5	3	2		3					3	3		

Mapping of CO with PSO

SEME3111	PSO1	PSO2	PSO3
CO 1	1	2	
CO 2	2	2	
CO 3			
CO 4	2	3	
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	Introduction	1, 2
2	Steady State Heat Conduction	2, 3, 4, 5
3	Unsteady state Heat Conduction (Transient)	2, 3, 4, 5
4	Heat Transfer from Extended Surfaces (Fins)	2, 3, 4, 5
5	Forced and Free Convection	2, 4, 5
6	Radiation	2, 4, 5
7	Heat Exchangers	2, 4, 5
8	Two Phase Heat Transfer	2, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3021
Course Name: Fluid Machines
Prerequisite Course(s): SEME2060-Fluid 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	-	04	40	60	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- learn about applications of Fluid Mechanics.
- understand fluid power and different major equipment which can produce power from fluid.
- learn about operation and use of different hydraulic machines like Hydraulic Crane, Hydraulic Ram, Hydraulic Lift, Hydraulic Jack, Accumulator, Intensifier etc.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Hydro Power Plant** Principles of Hydro Power Generation, Components and Layout of Hydro Power Plants, Classification; Advantages and Disadvantages of Hydro Power Plant.	02	04
2.	**Flow Over Immerged Bodies** Introduction, Concept of Lift and Drag, Concept of Streamline and Bluff Bodies, Flow over Cylinder and Aerofoil	02	04
3.	**Fans And Blowers** Construction details, governing equations, losses and performance curves	03	08
4.	**Impulse Turbines** Classification of Turbines, Impulse and Reaction, Radial and Axial, Tangential and Mixed flow turbines, Working Principle, Construction of Pelton Wheel, Expression for Work done and Efficiency for Pelton Turbine, Velocity Triangle, Performance characteristic curve, Unit and Specific Quantities, Governing of Impulse Turbines.	07	16
5.	**Reaction Turbines** Working Principle, Construction of Francis and Kaplan Turbines, Draft Tube Theory, Cavitation, Velocity Triangle, Performance characteristic curve, Unit and Specific Quantities, Governing of	08	18

	Reaction Turbines.		
Section II			
Module No.	Content	Hours	Weightage in %
6.	**Hydraulic Pumps** Classification, Principle of Dynamic and Positive Displacement Pumps, Centrifugal Pump and its Velocity Diagrams, Work Done by Impeller, Various Efficiencies of Pumps, Pump Losses, NPSH, Specific Speed, Characteristic Curves, Priming, Operation of Single and Double acting reciprocating Pump, Volumetric Efficiency; Work done and Slip, Special Purpose Pumps, Cavitation, Effect of Air Vessels	12	26
7.	**Impact of Jet** Impact of jet on different types of flat and curved plates, Force exerted on Fixed and Moving Plates, Expression of Efficiency, Condition for Maximum Efficiency and Value for maximum efficiency.	06	13
8.	**Miscellaneous Hydraulic Systems** Construction and Working of Hydraulic Intensifier, Hydraulic Accumulator, Hydraulic Jack, Hydraulic Ram, Hydraulic Crane, Hydraulic Fluid Couplings and Torque Convertor	05	11
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	To Study about Hydro Power Plant	02
2.	Performance test on Pelton Turbine	04
3.	Performance test on Francis Turbine	04
4.	Performance test on Kaplan Turbine	04
5.	Performance test on Centrifugal Pump	02
6.	Performance test on Reciprocating Pump	02
7.	Performance test on Gear Pump	02
8.	Performance Test on Hydraulic Ram	04
9.	Impact of Jet on Vanes	02
10.	Performance test on Pumps in Series and Parallel	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications
Introduction to Fluid Mechanics and Fluid Machines	S. K. Som & Biswas. G	Tata McGraw Hill Publication

Reference Book(s):

Title	Author/s	Publication
Fluid Mechanics and Fluid Power Engineering	D. S, Kumar	S K Kataria & Sons.
Turbines, Compressors and Fans	S. M. Yahya	Tata McGraw Hill Publication

Web Material Link(s):

- https://nptel.ac.in/courses/112104117/

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3021	FLUID MACHINES
CO1	Understand the fundamentals of hydro power plant and its operation and construction.
CO2	Understand and apply the effect and importance of forces on immersed bodies.
CO3	Apply the knowledge of different types of fans and blowers, turbines and pumps.
CO4	Evaluate the turbine and pump performance and understand various hydraulic systems and their purpose in hydraulic machines.
CO5	Understand the concept of impact of jets on different positions of blades.

Mapping of CO with PO

SEME3021	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1	1				1	1		2	1	
CO 2	3	2	2	3	2		2	1		1	1	1
CO 3	3	1	1	1	1					1	1	
CO 4	3	3	2	3	3	2	3			2	2	1
CO 5	3	3	2	3	3		1			1	2	

Mapping of CO with PSO

SEME3021	PSO1	PSO2	PSO3
CO 1	1		
CO 2	2	3	1
CO 3			
CO 4	3	3	2
CO 5	1	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	Hydro Power Plant	1, 2
2	Flow Over Immerged Bodies	1, 2, 5
3	Fans and Blowers	1, 2, 5
4	Impulse Turbines	1, 2, 5
5	Reaction Turbines	1, 2, 5
6	Hydraulic Pumps	1, 2, 5
7	Impact of Jet	1, 2, 5
8	Miscellaneous Hydraulic Systems	1, 2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3031
Course Name: Dynamics of Machinery
Prerequisite Course(s): SEME2081-Kinematics of Machinery

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- learn about turning moment diagrams and the dynamics of reciprocating engines.
- understand balancing procedure of rotating and reciprocating masses.
- learn about forced and free vibrations.
- learn about governors and gyroscope and their applications.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Force and Couple, Condition of Static Equilibrium, Free body diagrams, Analysis of Mechanism	02	05
2.	**Dynamic Force Analysis** D'Alembert Principal, Inertia Force, Dynamic analysis of Four bar Mechanism, Analysis of floating link, Method of virtual work, Turning Moment diagrams, Fluctuation of energy, Flywheel	12	30
3.	**Balancing** Need of balancing, Static balancing, Balancing of static masses in same and different planes, Dynamic Balancing, Balancing of reciprocating masses, Balancing of Inline, Radial and V- Engines	09	15
Section II			
Module No.	Content	Hours	Weightage in%
4.	**Vibrations – Single Degree Of Freedom** Introduction, Terminologies, Classification, Undamped and damped vibration, Viscous damping, Introduction of Coulomb Damping, Forced vibrations, Magnification Factor, Vibration Isolation and Transmissibility	08	20
5.	**Transverse And Torsional Vibrations**	08	20

	Longitudinal and transverse vibrations, Whirling of shaft with and without damping, Dunkerley 's method for simply supported beams Torsional Vibrations, Single; Two and Three rotor systems, Free vibration of gears systems		
6.	**Mechanism For Controls** Introduction, Types of Governors, Sensitivity, Hunting, Isochronisms, Stability, Effort and Power of Governors, Controlling Force, Angular velocity and Acceleration, Gyroscopic couple, Gyroscopic effect on naval ships, stability of an automobile	06	10
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	Whirling of Shaft Apparatus	02
2.	Balancing of Rotors	04
3.	Governors	04
4.	Gyroscopes	02
5.	Natural frequency of longitudinal vibration of spring mass system.	04
6.	Analysis of Cam and plotting the Cam profile	04
7.	Undamped free vibration of equivalent spring mass system	02
8.	Damped vibration of equivalent spring mass system	02
9.	BI –FILAR System	02
10.	TRI-FILAR System	02
11.	Viscous Vibration	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Theory of Machines	S S Rattan	Tata McGraw Hill
Theory of Machines	P L Ballaney	Khanna Publishers

Reference Book(s):

Title	Author/s	Publication
Theory of Machines and Mechanisms	J E Shigley	Tata McGraw Hill
Theory of Machines	V P Singh	Dhanpatrai Publications

Web Material Link(s):

- https://nptel.ac.in/courses/112101096/

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3031	**DYNAMICS OF MACHINERY**
CO1	Summarize dynamic forces and turning moments in mechanisms
CO2	Minimize unbalance in mechanical systems by means of static and dynamic balancing.
CO3	Demonstrate longitudinal vibrations, transverse vibrations and torsional vibrations in single degree of freedom systems.
CO4	Determine critical speed of the shaft.
CO 5	Discover gyroscopic effect in ships and automobiles & analyze effect of governor.

Mapping of CO with PO

SEME3031	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	1		3						
CO 2	3	3	3	1		3						3
CO 3	3	3	3	1		3				3		3
CO 4	3	3	3	1		3						1
CO 5	3	3	2	1		3			3	3		3

Mapping of CO with PSO

SEME3031	PSO1	PSO2	PSO3
CO 1	3	3	1
CO 2	3	3	1
CO 3	3	3	1
CO 4	3	3	2
CO 5	3	3	2

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

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

Module No	**Content**	**RBT Level**
1	Introduction	1, 2
2	Dynamic Force Analysis	2, 3, 4, 5
3	Balancing	2, 3, 4, 5
4	Vibrations-Single Degree of Freedom	2, 4, 5
5	Transverse and Torsional Vibrations	2, 4, 5
6	Mechanism for Controls	2, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3051
Course Name: Production Technology
Prerequisite Course(s): SEME2050 - Forming & Machining Processes,
SEME2110 – Casting & Joining Processes

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- introduce the students to the theory and mechanism of various cutting processes.
- grasp distinctive knowledge of gear forming and its generating method
- understand the usefulness of Jig & Fixtures, Presses and Press work.
- introduce students with nontraditional manufacturing techniques for shaping newer materials.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Theory of Metal Cutting** Cutting Tool Material, Types of cutting tools, Tool geometry and Force analysis. Theory of metal cutting: Orthogonal and oblique cutting, Mechanics of chip formation and types of chips produced, Chip thickness ratio, Shear plane angle and its effect, Forces, Coefficient of friction, Shear strain, Power in machining. Merchant circle diagram and its assumptions and use. Chip breakers, Tool Dynamometers, Tool wears and methods of tool failure, Tool life. Cutting fluids and their properties, Economics of machining, Machinability and its evaluation.	14	30
2.	**Thermal Aspects in Machining** Sources of heat generation in machining and its effects, Temperature Measurement techniques in machining, types of cutting fluids, Functions of cutting fluid, Characteristics of cutting fluid, Application of cutting fluids, Economics of Metal Cutting Operations.	05	12
3.	**Gear and Thread Manufacturing** Different types of Threads manufacturing methods, and tools involved, Different gear forming and generating methods with their special features, Gears finishing processes.	04	08

Section II			
Module No.	Content	Hours	Weightage in %
4.	**Press Tool** Classification of presses, Classification of dies, cutting actions in dies, clearance, cutting forces, Methods of reducing cutting forces, Minimum Diameter of Piercing Center of Pressure, Blanking, Piercing, Drawing, Bending and Progressive Die design, scrap reduction, strip layout.	08	18
5.	**Jigs and Fixtures** Definition, Differences between Jigs and Fixtures, Its usefulness in mass production, design principles, 3-2-1 location principle and its application to short and long cylinders, types of locators, concept of work piece control, geo metric control, dimensional control and mechanical control, Clamps, jig bushes, Jigs and fixtures for various machining operations.	06	14
6.	**Modern Machining Processes** Purpose, Need and Classification, Aspects considered in selection of a process. Principle, construction, working of the following processes: Ultrasonic machining, Abrasive jet machining, Water jet machining, Chemical Machining, Electro Chemical Machining and Grinding, Electro discharge Machining, Plasma arc machining, Laser beam machining, Electron beam machining.	08	18
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	Study of various types of cutting tools and measurement of tool geometry	04
2.	To Understand the Effect of Chosen Parameters on the type of chip produced	04
3.	Determination of chip-thickness ratio and shear plane Angle During Machining	04
4.	Measurement of cutting forces in turning using Lathe Tool Dynamometer under various cutting conditions	04
5.	To study the Temperature Measurement on chip tool interface	04
6.	To study and understand the effect of a suitable cutting lubricant	04
7.	Design a Jig and Fixture for given component	04
8.	To study different press and design of punch and die, also exercise on strip layout and center of pressure	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
A Text Book of Production Engineering	Sharma P C	S. Chand Publishers
Production Technology	R K Jain	Khanna Publication

Reference Book(s):

Title	Author/s	Publication
Production Technology	HMT	Tata McGraw Hill Pub
Metal Cutting principles	M C Shaw	Oxford University press
Fundamentals of machining and machine tools	Boothroyd	CRC publication
Workshop Technology Vol. II	Raghuvanshi	Dhanpat rai Pub

Web Material Link(s):

- http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Manuf%20Proc%20II/New_index1.html

Course Evaluation:

Theory:

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

Practical/Tutorial:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3051	PRODUCTION TECHNOLOGY
CO1	Understand the theory of metal cutting process, dynamometer tools, tool wear and economics of machining.
CO2	Explain the thermal behaviour of metal during metal cutting operation.
CO3	Apply and develop gears and threads through basic knowledge of gear and thread manufacturing process.
CO4	Interpret the function of the press tool and jigs and fixtures.
CO5	Interpret modern machining processes for material removal application.

Mapping of CO with PO

SEME3051	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	3	3	2	3	3	1	3	3	3
CO 2	3	3	3	3	3	2	3	3	2	3	3	3
CO 3	3	3	3	3	3	3	3	3	2	3	3	3
CO 4	2	1	2	2	3	3	3	1	3	3	3	3
CO 5												

Mapping of CO with PSO

SESH1070	PSO1	PSO2	PSO3
CO 1	3		
CO 2	1	1	
CO 3	1	2	
CO 4	2	1	
CO 5	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	Theory of Metal Cutting	1, 2, 5
2	Thermal Aspects in Machining	1, 2, 5
3	Gear and Thread Manufacturing	1, 2, 3
4	Press Tool	1, 2
5	Jigs and Fixtures	1, 2
6	Modern Machining Processes	1, 2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3090
Course Name: Industrial 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	-	-	03	40	60	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- provide students insight into the concept of industrial engineering.
- familiarize the students with principles of work study and motion study.
- realize the importance of plant design and production planning in industries.
- enable the students to understand cost analysis and inventory management.
- understand about various Industrial Acts.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Industrial Engineering** Introduction, History; Activities and Techniques of Industrial Engineering, Concepts of Management and Organization, Departmentalization and Decentralization, Types of Organizations	03	05
2.	**Work Study & Productivity** Production and Productivity, Factors influencing productivity, Measurement of Productivity (Productivity Index), Work Content, Excess work and Ineffective Time, Method Study – Objective, Steps, Selection of job, Process Charts, Micro and Memo motion study, Work Measurement – Objectives, Steps, Techniques, Performance Rating, Allowance of Standard time, Techniques of work measurement, Work Sampling – Confidence level, Methods of work sampling, Computation of machine utilization and standard time, Predetermined Motion and Time Study (PMTS), Method Time Measurement (MTM)	14	30
3.	**Economics of Plant Layout And Location** Plant Location, Factors affecting Plant Layout, Importance and Principles of Plant Layouts, Types of Layout – Product or Line Layout, Process or Functional Layout, Fixed Position Layout, Travel Chart.	05	15
Section II			

Module No.	Content	Hours	Weightage in %
1.	**Cost And Break Even Analysis** Cost of Production, Classification of Cost, Analysis of Production Cost, Break Even Analysis – Graphical and Mathematical and Break Even Point, Applications of Break Even Chart and Break Even Analysis, Determination of Material Cost, Labour Cost, Expenses, Over Head Expenses, Methods and procedure of job evaluation, merit rating and wage incentive plans - Problems	08	20
2.	**Production Planning And Control (PPC)** Types of Production, Production Cycle – Process Planning, Forecasting, Loading, Scheduling, Dispatching, Routine. Material Planning, ABC Analysis, Incoming Material Control, Kanban System, MRP System, Master Production Schedule, Bill of Materials, MRP Calculations	11	25
3.	**Industrial Acts** Need for Industrial acts, Factories act 1948, Industrial dispute act 1947, The Indian trade unions act 1926, Industrial employment act 1946, Payment of wage act 1936, Workmen compensation act 1923, Payment of bonus act 1965, Employees provident fund scheme 1952	04	05

Text Book(s):

Title	Author/s	Publication
Industrial Engineering and Production Management	M. Mahajan	Dhanpat Rai & Sons.
Industrial Engineering and Production Management	M. Telsung	S. Chand & Co.

Reference Book(s):

Title	Author/s	Publication
Industrial Engineering and Operational Management	S. K. Sharma Savita Sharma	S. K. Kataria & Sons

Web Material Link(s):

- https://nptel.ac.in/courses/112107142/

Course Evaluation:

Theory:

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

Course Outcome(s):

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

SEME3090	INDUSTRIAL ENGINEERING
CO 1	Express concepts of industrial engineering & apply work and motion management techniques in industries.
CO 2	Describe location decision, site selection and plant layout
CO 3	Analyse cost of production & demonstrate wage and incentive plans.
CO 4	Solve forecasting problem by applying different techniques.
CO 5	Understand industrial legislation.

Mapping of CO with PO

SEME3090	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2				3			3	3	1	3
CO 2	1	2	1			3			3	3	1	3
CO 3	2	2	1			3			1	3	3	3
CO 4	3	2	1			3			1	3	3	3
CO 5	1	1				3				3		3

Mapping of CO with PSO

SEME3090	PSO1	PSO2	PSO3
CO 1		3	2
CO 2	3	3	1
CO 3	3	2	2
CO 4	3	3	2
CO 5	1	2	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	Industrial Engineering	1, 2
2	Work Study & Productivity	1, 2
3	Economics of Plant Layout and Location	1, 2
4	Cost and Break Even Analysis	1, 2, 5
5	Production Planning and Control (CPC)	1, 2, 5
6	Industrial Acts	1, 2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3910
Course Name: Summer Training
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	
-	04	-	04	-	-	100	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- have first-hand experience the real time situations in industrial scenario.
- get familiar with engineering applications in industrial spectrum
- learn to adapt themselves in professional scenario

Outline of the Course:

Sr. No	Content
1.	Selection of Companies
2.	Company Information collection
3.	Report Writing
4.	Presentation & Question-Answer

Course Evaluation:

Sr. No.	Evaluation criteria	Marks
1	Actual work carried & Report Submission	50
2	Final Presentation & Question-Answer session	50
	Grand Total:	**100**

Report Writing Guidelines
A. Report Format:

1. Title Page (to be provided by the respective supervisor)

The title page of the project shall give the following information in the order listed:
- Full title of the project as approved by the Mentor;
- The full name of the student/Group of students with enrollment number;
- The qualification for which the project is submitted;
- The name of the institution to which the project is submitted;
- The month and year of submission.

2. Project Certification Form
   [The form should be duly filled signed by the supervisors.]
3. Acknowledgements
   [All persons (e.g. supervisor, technician, friends, and relatives) and organization/authorities

who/which have helped in the preparation of the report shall be acknowledged.]

4. Table of Contents/Index with page numbering
5. List of Tables, Figures, Schemes
6. Summary/abstract of the report.
7. Introduction/Objectives of the identified problem
8. Data Analysis and Finding of Solution
9. Application of the identified solution
10. Future Scope of enhancement of the Project and Conclusion
11. "Learning during Project Work", i.e. "Experience of Journey during Project Duration"
12. References(must)
13. Bibliography
14. Annexures (if any)

B. Guideline for Report Formatting:

- Use A4 size page with 1" margin all sides
- Header should include Project title and footer should contain page number and enrollment numbers
- Chapter Name should be of Cambria font, 20 points, Bold
- Main Heading should be of Cambria font, 14 points, Bold
- Sub Heading should be of Cambria font, 12 points, Bold
- Sub Heading of sub heading should be of Cambria font, 12 points, Bold, Italic
- Paragraph should be of Cambria font, 12 points, no margin at the start of the paragraph
- Line spacing for all content – 1.15, before - 0, after - 0
- No chapter number for references
- Before chapter 1, give page numbers in roman letter

Course Outcome(s):

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

SEME3910	**SUMMER TRAINING**
CO1	Construct company profile by compiling brief history, management structure, products/services offered, key achievements and market performance for the company visited during internship.
CO2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
CO5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO

SEME3910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		2	3	3	3	3	3	3	3	3	3	3
CO 2	3	2	3	3	3	3	3	3	3	3	3	3
CO 3	3	2	3	3	3	3	3	3	3	3	3	3
CO 4	3	2	3	3	3	3	3	3	3	3	3	3
CO 5		2	3	3	3	3	3	3	3	3	3	3

Mapping of CO with PSO

SEME3910	PSO1	PSO2	PSO3
CO 1	2	3	3
CO 2	2	3	3
CO 3	2	3	3
CO 4	2	3	3
CO 5	2	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	Selection of Companies	1, 2, 5
2	Company Information collection	1, 2, 5
3	Report Writing	1, 2, 3
4	Presentation & Question-Answer	1, 2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3140
Course Name: Design of Machine Elements
Pre requisite Course: -- SEME3031 – Dynamics of Machinery, SEME2081 – Kinematics of Machinery

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	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand design consideration and material selection for particular applications.
- learn design methodology/procedure for machine elements.
- Understand standards of materials designation and machine elements.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Process of Design, Framework of Design, Designing Methods, Concurrent Engineering	04	09
2.	**Design Analysis** Types of Loads, Types of Stresses, Types of Failures, Factor of Safety, Theory of failure, Fatigue failure analysis, Soderberg, Gerber and Goodman Criteria, Estimation of life of components, Introduction to creep and wear failure	07	16
3.	**Material Selection** Selection of material, Factors affecting material selection, Ferrous and Non Ferrous metals and alloys, Plastics, BIS designation system for steels	05	12
4.	**Design of Springs** Types, Terminologies and Types of ends in helical springs, Stress and Deflection Equations, Correction Factors, Design of helical spring against static and fluctuating loads, Multileaf spring : Terminologies, Nipping and Design	06	14

Section II			
Module No.	Content	Hours	Weightage In %
5.	**Design of Shafts and Keys** Types of Shafts, ASME code for shaft design, Design of shaft, Types of Keys, Design of Keys	07	16
6.	**Design of Screw And Threaded Fastness** Types of threads, Terminologies and Design of Power Screw, Design of Screw and Nut, Design of Screw Jack, Types of Screw Fastening, Bolt of uniform strength, ISO Metric screw threads	06	13
7.	**Design of Joints** Design of Cotter and Knuckle Joints, Strength of welded joints, Strength of riveted joints, Efficiency of Joints	06	13
8.	**Belt Drives and Brakes** Brakes, Energy Equations, Block Brake with Short and Long Shoe, Band and Disc Brake, Selection of Flat belts from manufacturer 's catalogue, Selection of V-Belts	04	08
	TOTAL	45	100

List of Tutorial:

Sr No	Name of Tutorial	Hours
1.	Design consideration and Material selection	01
2.	Design Analysis against static and fluctuating loads.	01
3.	Design of Cotter Joints	01
4.	Design of Knuckle Joints	01
5.	Design of Helical Springs	02
6.	Design of Multileaf Springs	02
7.	Design of Power Screw	01
8.	Design of Screw Jack	02
9.	Design of Shafts	02
10.	Design of Keys	01
11.	Design of Belt Drives	01
	TOTAL	15

Text Book(s):

Title	Author/s	Publication
Design of Machine Elements	V B Bhandari	McGraw Hill Eduction
Mechanical Engineering Design	Joseph Shigley	McGraw Hill Eduction

Reference Book(s):

Title	Author/s	Publication
Design Data Book		PSG College of Technology
Fundamental of Machine Components Design	R C Junival	John Wiley Publication

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Tutorial which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3140	**DESIGN OF MACHINE ELEMENTS**
CO 1	Describe the design process, designing methods and selection of proper material for design of machine element.
CO 2	Analyze forces acting on machine elements under static and cyclic loading conditions.
CO 3	Determine forces and stresses acting on machine elements like springs, shaft, screw, threaded fasteners, belt drives and brakes.
CO 4	Design the temporary and permanent joints required to assemble the machine elements.
CO 5	Design and dissect mechanisms for strength and improve their life.

Mapping of CO with PO

SEME3140	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1	1	2		1		1	2	2	
CO 2	2	3	1	1	2		1		1	2		
CO 3	2	3	1	1	2		1		1	2		
CO 4	2	1	2	1	2		2	1	1	1	2	
CO 5	2	1	2	1	2		2	1	1	1	2	

Mapping of CO with PSO

SEME3140	PSO1	PSO2	PSO3
CO 1	1	2	
CO 2	2	1	
CO 3	3	1	
CO 4			
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	Introduction	1, 2
2	Design Analysis	1, 2, 4
3	Material Selection	1, 2, 4
4	Design of Springs	1, 2, 3, 4, 5
5	Design of Shafts and Keys	1, 2, 3, 4, 5
6	Design of Screw and Threaded Fasteners	1, 2, 3, 4, 5
7	Design of Joints	1, 2, 3, 4, 5
8	Belt Drives and Brakes	1, 2, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3121
Course Name: Internal Combustion Engines
Pre requisite Course: -- SEME2011 – Engineering Thermodynamics

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	-	03	40	60	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand basics of IC engine and emission control.
- Examine the performance parameters of IC engines.
- Inspect the rating and testing performance of IC engines.
- Justify the alternative fuels for IC engine.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
5.	**Introduction** Comparison of SI and CI Engines, Difference in thermodynamic and operating variables, comparison of performance characteristics, comparison of initial and maintenance costs application of SI and CI engine.	04	13
6.	**Fuel and its Supply System for SI and CI Engine** Important qualities of IC engine fuels, rating of fuels, Carburetion, mixture requirement for different loads and speeds, simple carburetor and its working, types of carburetors, MPFI, types of injection systems in CI engine, fuel pumps and injectors, types of nozzles, spray formation.	04	16
7.	**Combustion in SI and CI Engines** Combustion equations, calculations of air requirement in I C Engine, stoichiometric air fuel ratio, proximate and ultimate analysis, enthalpy of formation, adiabatic flame temperature. Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine.	05	15

8.	**Engine Lubrication** Types of lubricants and their properties, SAE rating of lubricants, Types of lubrication systems. **Engine Cooling** Necessity of engine cooling, disadvantages of overcooling, Cooling systems and their comparison: Air cooling, Liquid cooling. **Supercharging/ Turbo-Charging** Objectives, Limitations, Methods and Types, Different arrangements of turbochargers and superchargers.	05	14
Section II			
Module No.	Content	Hours	Weightage In %
5.	**Rating, Testing and Performance** Measurements of speed, air flow, fuel consumption, indicated power brake power, frictional horse power, and smoke, testing of engines as per Indian Standard 10001, performance test for variable speed I C Engines, heat balance sheet, governing test for constant speed IC engines, effect of fuel injection parameters in CI engines and ignition advance of SI engines on performance of engine. Rating of internal combustion engine based on (I) continuous operation of engine (II) Maximum power an engine can develop (III) Power calculated from empirical formula, Trouble Shooting and Overhauling of Engines.	05	16
6.	**Emission of IC Engine** Emission from SI engine, effect of engine maintenance on exhaust emission control of SI engine, diesel emission, diesel smoke and control, diesel and control comparison of gasoline and diesel emission. Measurement and calculation for of emission constituents.	04	13
7.	**Unconventional Engines & Alternative Fuels for IC Engine** Working principle of stratified charge engines sterling engine, Wankel engine Methanol, Ethanol, vegetable oils, bio gas, bio-fuels, hydrogen and comparison of their properties with Diesel and petrol.	03	13
	TOTAL	30	100

List of Tutorial:

Sr No	Name of Tutorial	Hours
1	To demonstrate various engines and their components.	02
2	Demonstration of valve timing diagram.	04
3	To demonstrate about the fuel injection system for C.I. Engine.	04
4	To demonstrate about carburetor and its types.	04
5	To carry out the performance analysis of single cylinder two stroke petrol engine.	04
6	To carry out the performance analysis of multi cylinder four stroke petrol engine.	04
7	To carry out the performance analysis of multi cylinder four stroke diesel engine.	04
8	To carry out various Performance tests: Morse Test and William Line Plot.	04

		TOTAL	30

Text Book(s):

Title	Author/s	Publication
IC Engine	Heywood	-
IC Engines	Marthur & Sharma	Dhanpatrai Publication

Reference Book(s):

Title	Author/s	Publication
IC Engines	V.Ganeshan	Tata McGraw Hill
IC Engine	Domkundwar & Domkundwar	Dhanpatrai Publication
IC Engine	R.K. Rajput	Laxmipublication

C**ourse Evaluation:**

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Tutorial which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3121	INTERNAL COMBUSTION ENGINES
CO 1	Describe and explain the major phenomena going on in an internal combustion engine such as gas exchange, combustion and emissions formation/reduction.
CO 2	Explain the performance and evaluation of internal combustion engine and to discuss how this is affected.
CO 3	Reflect on the role of internal combustion engines for transports in society as well as the emissions issue from both a sustainable and ethical perspective.
CO 4	Understand and explain about the alternative fuels and their properties
CO 5	Explain the latest development of unconventional engines.

Mapping of CO with PO

SEME3121	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1			1		2				2	
CO 2	3	1			2	2		2				
CO 3	3	1	2	1	3					2	1	
CO 4	1	1	1	1	3						1	
CO 5	1	1		2	2	2					2	

Mapping of CO with PSO

SEME3121	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	1	1	
CO 3	2	3	
CO 4	1	1	
CO 5	1	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	Introduction	1, 2
2	Fuels and its supply system for SI and CI engine	1, 2
3	Combustion in SI and CI engines	1, 2, 4, 5
4	Engine lubrication, Engine cooling, and Supercharging/ Turbo-Charging	1, 2, 3
5	Rating, Testing and Performance	1, 2, 3, 4, 5
6	Emission of IC Engine	1, 2, 3, 4, 5
7	Unconventional Engines & Alternative Fuels for IC Engine	1, 2, 3

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3080
Course Name: Computer Aided Design and Manufacturing
Prerequisite Course(s): -- SEME2090 – Software Tools for Mechanical Engineers

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand the basic aspects of CAD/CAM.
- gain exposure over the concepts of computer graphics.
- learn geometric modelling and issues in manufacturing.
- develop strong skill of writing CNC programs.
- educate students to understand different advances in manufacturing system like: GT, FMS and RP.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Fundamental of CAD** Application of computer for design, Product Cycle and CAD-CAM, Graphics input-output devices, Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System, Graphics exchange standards - Neutral file formats – IGES, STEP	03	05
2.	**Principles of computer Graphics** Introduction to Computer graphics, Scan conversions and Algorithm for generation - DDA, Bresenham's algorithms., 2D and 3D Transformation - Translation, Scaling, Reflection, Rotation, Shearing	07	15
3.	**Geometric Modeling** Representation of curves and surfaces, Geometric modeling techniques, Wireframe modeling, Surface Modeling and Solid Modeling, Feature based Parametric and Variation modeling.	07	15
4.	**Finite Element Analysis** Design and analysis and Historical background, Stresses and equilibrium, Boundary conditions, Strain-Displacement relations, Plane stress and plane strain cases, Concept of Raleigh-Ritz and Galerkin's methods, Review of matrix algebra, Generalized procedure for Finite element analysis, Types of elements and Finite	07	15

	element modeling, Coordinates and shape functions, Design problems of structural analysis, Applications and capabilities of various software for FEA.		
Section II			
Module No.	Content	Hours	Weightage in %
5.	**CNC Machine Tools** Introduction to NC, CNC, DNC, Manual Part programming, Computer assisted part programming, Components of NC/CNC system, Specification of CNC system, Classification of NC/CNC Machine tools, Nomenclature of NC machine axes, CNC Control System, CNC Programming, Automatic tool changer, Automatic Pallet Changer, Machine tool structure, Guideways, Transmission system, Drives and Feedback Devices, NC/CNC tooling, Canned cycles and subroutines, APT language, Machining from 3D models.	11	30
6.	**Introduction to Group Technology, FMS and Rapid Prototyping** Objectives, part families, similarities, design and Manufacturing attributes, Classification methods- visual inspection, product flow analysis and coding, G.T. machine cells and types, concept of composite part, benefits and limitations, Flexible Manufacturing system (FMS) – Concept, objectives, applications, classification, FMS layouts, specifications, benefits, limitations, FMS planning and implementation issues, Fundamentals of Rapid Prototyping, Advantages and Applications of RP Types of Rapid Prototyping Systems	07	15
7.	**Computer Integrated Manufacturing** Basic information of CIMS, hardware and software requirement for CIMS, benefits, scope and Needs, CIMS wheel, elements of CIMS and their role, Fundamentals of communication, data base management	03	05
	TOTAL	45	100

List of Practical:

Sr No	Name of Practical	Hours
1.	Prepare a programme for plotting lines and curves using algorithms learned	02
2.	Demonstration of 3D modeling using CAD Packages	04
3.	Demonstration of stress analysis using FEA package	06
4.	Part Programming using G and M code: Lathe and Milling jobs	04
5.	Simulation of part programme	06
6.	CNC code generation using any CAM software	04
7.	Problems on Group Technology and Industrial case problems on coding	02
8.	Study of Expert System in Manufacturing and MIS	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
CAD, CAM and CIM	Radhakrishan P. and Subramaniyam S.	New Age International
Numerical control and computer aided manufacturing	Kundra T. K., Rao P. N. and Tewari N. K.	Tata McGraw Hill Publishing company Ltd.

Reference Book(s):

Title	Author/s	Publication
CAD / CAM: Theory and Practice	Ibrahim Zied,	Tata McGraw Hill Publishing company Ltd.
CAD/CAM	Rao P. N.	Tata McGraw Hill Publishing company Ltd.
Computer numerical control machines	Radhakrishnan P	New Central Book Agency
CAD/CAM Computer Aided Design and Manufacturing	M. P. Groover, E. W. Zimmers	Prentice Hall of India, New Delhi.
CNC Programming handbook	Peter Smid	Industrial Press Inc, New York

Web Material Link(s):

- http://help.autodesk.com/view/fusion360/ENU/
- https://academy.autodesk.com/course/83871/essentials-cam
- https://www.autodesk.com/products/fusion-360/blog/getting-started-introduction-to-cam-and-toolpaths/
- https://knowledge.autodesk.com/support/fusion360/learnexplore/caas/CloudHelp/cloudhelp/ENU/Fusion-GetStarted/files/GUID-A93F8BAB-1B3B-457F9265-AFD16D8B732A-htm.html

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME3080	COMPUTER AIDED DESIGN & MANUFACTURING
CO 1	Apply algorithms of graphical entity generation.
CO 2	Construct a mathematical model of geometrical modelling and transformation
CO 3	Formulate finite element model for analysis of simple components.
CO 4	Develop programs related to manufacturing using cnc codes
CO 5	Classify different components using different techniques of group technology.

Mapping of CO with PO

SEME3080	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1			1							
CO 2	3	1			2							
CO 3	3	1	2	1	3						1	
CO 4	1	1	1	1	3						1	
CO 5	1	1		2	2						2	

Mapping of CO with PSO

SEME3080	PSO1	PSO2	PSO3
CO 1	1	2	3
CO 2	2	2	2
CO 3	2	2	2
CO 4	2	2	1
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	Fundamental of CAD	1, 2, 3
2	Principles of Computer Graphics	1, 2, 3
3	Geometric Modeling	1, 2, 3, 6
4	Finite Element Analysis	1, 2, 3, 4, 6
5	CNC Machine Tools	1, 2
6	Introduction to Group Technology, FMS and Rapid Prototyping	1, 2. 3
7	Computer Integrated Manufacturing	1, 2

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME3130
Course Name: HVAC Systems
Prerequisite Course(s): - SEME2011 – Engineering Thermodynamics, SEME3111 – Heat & Mass Transfer

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	-	03	40	60	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- Clarify the concepts of refrigeration and air-conditioning .
- Explore the different types of refrigeration and air conditioning systems.
- Selection of refrigerant under different condition with application and properties.
- Elaborate the various Psychrometric Processes and its applications.
- Estimate load calculation for air conditioning for buildings.

Course Content:

Section I			
Module No.	Contents	Hours	Weightage in %
1.	**Fundamentals of Refrigeration:** Methods of producing cooling, ton of refrigeration, coefficient of performance, types and application of refrigeration, Classification of refrigerant, nomenclature, desirable properties of refrigerant, secondary refrigerants, future industrial refrigerants, VCR System, P – h and T – s Diagrams, analysis of simple cycle, actual cycle.	06	20
2.	**Psychrometry:** Dalton's law of partial pressure, Properties of moist air, temperature and humidity measuring instruments, psychrometric chart, psychrometric processes such as sensible heating and cooling, heating and humidification cooling and dehumidification, chemical dehumidification, adiabatic saturation	06	20
3.	**Air Conditioning Systems:** Classification, system components, all air; all water; and air-water systems, room air conditioners, packaged air conditioning plant, central air conditioning systems, split air conditioning systems	03	10

Section II			
Module No.	Contents	Hours	Weightage in %
4.	**Duct Design and Air Distribution:** Function; classification and economic factors influencing duct layout, equal friction, velocity reduction and static regain methods of duct design, use of friction chart, dynamic losses and its determination, Requirements of air distribution system, air distribution, grills, outlets, application, location	06	20
5.	**Load Analysis:** Site survey, outdoor and indoor design conditions, classification of loads, flywheel effect of building material and its use in design, effect of wall construction on cooling load, instantaneous heat gain (IHG) and instantaneous cooling load (ICL) heat transmission through sunlit and shaded glass using tables, method of reduction of solar heat gain through glass, calculations of cooling load TETD due to sunlit and shaded roof and walls using tables, ventilation and air infiltration, load due to outside air, heat gain from occupants; electric lights; product; electric motor and appliances, load calculations for automobiles, use of load estimation sheet.	06	20
6.	**Vapour Absorption Refrigeration Cycle:** Desirable characteristics of refrigerant, selection of pair, practical H_2O -NH_3 cycle, LiBr – H_2O system and its working, Electrolux refrigeration system	03	10
	TOTAL	30	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Performance Test of VCR System	04
2.	Performance Test of VAR System	04
3.	Performance test on Recirculating Type Air Conditioning Dust to learn various Psychrometric Processes.	04
4.	To understand various tools used for refrigeration tubing and to perform various operations like flaring, swaging, bending, brazing etc.	02
5.	To calculate cooling load of a confined space using table and compare the same with load estimation sheet.	04
6.	To design duct layout of the confined space selected for above.	04
7.	Performance Test of Sling Psychrometer to determine DBT & WBT.	04
8.	Performance test on heat pump test rig.	04
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Refrigeration & Air Conditioning	C P Arora	McGraw Hill India Publishing House
Refrigeration & Air Conditioning	R K Rajput	S Chand and Co

Reference Book(s):

Title	Author(s)	Publication
Refrigeration & Air Conditioning	Ramesh Arora	Prentice Hall of India

Course Evaluation:

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

Practical:

- Continuous Evaluation consists of Performance of Practical/Tutorial which will be evaluated out of 10 for each practical/Tutorial and average of the same will be converted to 10 Marks.
- Internal Viva consists of 10 Marks.
- Practical performance/quiz/drawing/test will consist of 15 Marks during End Semester Exam.
- Viva/Oral performance will consist of 15 Marks during End Semester Exam.

Course Outcome(s):

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

SEME3130	HVAC Systems
CO 1	Select proper refrigerant for various applications and make basic calculations of VCR System.
CO 2	Explore construction and working of different Air Conditioning systems.
CO 3	Estimate Air Conditioning Load Calculation for buildings.
CO 4	Select proper air-conditioning system for various applications and construct duct layout for the systems.
CO 5	Understand various Psychrometric Processes and Its applications.

Mapping of CO with PO

SEME3130	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1					1					
CO 2	3	1	3	2	2	1	1					
CO 3	3	3	2	2	3		1					
CO 4	2	2	3	1	3		1					
CO 5	3	2	1	2	2							

Mapping of CO with PSO

SEME3130	PSO1	PSO2	PSO3
CO 1	2	3	
CO 2	2	1	
CO 3	3	2	
CO 4	2	2	
CO 5	1	1	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	Fundamentals of Refrigeration	1,2,3,4
2	Psychrometry	1,2,3
3	Air Conditioning Systems	1,2,3
4	Duct Design and Air Distribution	1,2,3,4,5
5	Load Analysis	1,2,3,4,5,6
6	Vapour Absorption Systems	1,2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3101
Course Name: Power Plant Engineering
Prerequisite Course(s): SEME2011-Engineering Thermodynamics, SEME3111 – Heat & Mass Transfer

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	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- identify which are the different power plants in operation with fundamentals various power generation units.
- interpret economics of power generation and country's energy hunger and potential.
- understand different power plant units like Steam based, gas-based power plants, Hydro and Nuclear power plants.
- explore power plants based on renewable resources like Solar, Wind, Geothermal, Tidal.

Course Content:

Section I			
Module. No.	Content	Hours	Weightage in %
1.	**Thermal Power Plant** General Layout of modern power plant, Site selection, Present status of power generation in India.	03	07
2.	**Economics of Power Generation** Load duration curves, Connected load, Maximum load, Peak load, Base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, Cost of power plant, Performance and operating characteristics of power plant, Tariff for electric energy.	08	18
3.	**High Pressure Steam Generators** Unique features and advantages, La-Mont; Benson; Velox, Loeffler and Schmidt-Hartmann boilers, Supercritical, Positive circulation, Fluidized bed combustion.	05	12
4.	**Coal and Ash handling Systems** Coal handling and preparation, Combustion equipment and firing methods, Pulverized mills, Mechanical Stokers, Pulverized coal firing systems, Cyclone Furnace, Necessity of Ash disposal, Ash handling systems, Dust collection and its disposal, Mechanical Dust Collector, Electrostatic precipitator.	06	13

Section II			
Module. No.	Content	Hours	Weightage in %
5.	**Draught System** Natural draught – Estimation of height of chimney, Maximum discharge condition, Forced; induced and balanced draught, Power requirement by fans	04	08
6.	**Nuclear and Hydro Power Plant** Principal of Nuclear energy, Nuclear fission and chain reaction, types of reactors, Boiling water reactor, Pressurised water reactor, Pressurised Heavy water reactor, CANDU reactor Gas cooled reactor, fast breeder reactor, Classification of Hydro-electric power plants and their applications.	08	17
7.	**Feed Water Treatments** Internal & external water treatment systems – Hot lime soda process, Zeolite ion exchange process, Demineralization plants, Reverse osmosis process, Sea water treatment using reverse osmosis, De-aeration	05	12
8.	**Condensers and Cooling Tower** Types of Condensers, Condenser Efficiency, Mass of cooling water required, Terminology of Cooling tower, Types of cooling tower and cooling ponds	06	13
	TOTAL	45	100

List of Tutorial:

Sr. No.	Name of Tutorial	Hours
1.	To solve the numerical based on Economics of power generation.	02
2.	Study the various Feed water treatment for steam generators.	02
3.	Selection of induced and forced draft fans and height of chimney.	02
4.	A case study of Nuclear Power Plant.	02
5.	To understand India's 3-Stage Nuclear Programme and nuclear power plants in India.	02
6.	To Study various types of condenser and cooling towers.	02
7.	A Case study of thermal power plant.	02
8.	Industrial visit report on Power Plant Visit.	01
	TOTAL	15

Text Book (s):

Title	Author/s	Publication
Power Plant Engineering 4e	P.K. Nag	McGraw-Hill Education

Reference Book(s):

Title	Author/s	Publication
A Course in Power Plant Engineering	S. C Arora and S. Domkundwar	Dhanpat Rai & Co.
A Text Book of Power Plant Engineering	R. K. Rajput	Laxmi Publications (P) Ltd.
Power Plant Technology	M.M. El-Wakil	McGraw-Hill Education

Web Material Link(s):

- https://nptel.ac.in/courses/112107216/ (Review of Thermodynamics)
- https://nptel.ac.in/courses/108105058/8 (Thermal Power Plants)
- https://nptel.ac.in/courses/112106133/15(Capacity of Steam Power Plant)

Course Evaluation:

Theory:

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

Tutorial:

- Model Preparation task consists of 10 marks.
- Internal Viva consists of 10 marks.
- 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:

SEME3101	**POWER PLANT ENGINEERING**
CO 1	Interpret different parameters associated with power generation and supply.
CO 2	Define the role of various power plants for fulfilment of energy requirement of country.
CO 3	Identify the india‘s 3 stage nuclear programme and current power generation by nuclear plants.
CO 4	Understand various components and requirements of different power plants.
CO 5	Explore various coal & ash handling systems and feed water treatments.

Mapping of CO with PO

SEME3101	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1								3		1
CO 2	2					2	3			3		3
CO 3	2					2	3	3		3		3
CO 4	2									3		1
CO 5	2						3	3		3		

Mapping of CO with PSO

SEME3101	PSO1	PSO2	PSO3
CO 1			
CO 2	3	3	
CO 3		3	
CO 4			
CO 5			

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

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

Module No	Content	RBT Level
1	Thermal Power Plant	1, 2
2	Economics of Power Generation	1, 2, 3
3	High Pressure Steam Generators	1, 2, 3
4	Coal and Ash Handling Systems	1, 2
5	Draught System	1, 2, 3
6	Nuclear and Hydro Power Plant	1, 2
7	Feed Water Treatments	1, 2
8	Condenser and Cooling Tower	1, 2, 3

FOURTH YEAR B. TECH.

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
TEACHING & EXAMINATION SCHEME FOR B. TECH. MECHANICAL PROGRAMME AY:2021-22															
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**	
7	SEME4011	Control Engineering	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME4021	Renewable Energy Sources & Systems	ME	3	2	0	5	4	40	60	20	30	0	0	150
	SEME4061	Design of Power Transmission Elements	ME	3	0	1	4	4	40	60	0	0	20	30	150
	SEME4040	Operations Research	ME	3	0	1	4	4	40	60	0	0	50	0	150
	SEPD4010	Creativity, Problem Solving & Innovation	SEPD	3	0	0	3	3	100	0	0	0	0	0	100
	SEME4910	Project/Summer Internship	ME	4			0	4	40	60	0	0	100	0	0
		Elective-II	ME	2	2	0	4	3	40	60	20	30	0	0	150
						Total	**23**	**25**							**900**
8	SEME4920	Project/Training	ME	24			24	24	0	0	200	300	0	0	500
						Total	**24**	**24**							**500**

ELECTIVE-II COURSES															
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**	
7	SEME3512	Advanced Manufacturing Technology	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3551	Electrical Technology	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3521	Applied Thermodynamics	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3631	Automobile Engineering	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME3650	Quality Engineering & Reliability	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME4521	Tools Design	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME4511	Design of Heat Exchangers	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME4530	AI in Manufacturing	ME	2	2	0	4	3	40	60	20	30	0	0	150
	SEME4540	Industry 4.0 & IoT	ME	3	0	0	3	3	40	60	0	0	0	0	100
	SEME3512	Advanced Manufacturing Technology	ME	2	2	0	4	3	40	60	20	30	0	0	150

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME4011
Course Name: Control Engineering
Prerequisite Course(s): SESH2211- Basics of Electrical & Electronics

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
- develop the mathematical model of the physical systems.
- analyze the response of the closed and open loop systems.
- analyze the stability of the closed and open loop systems.
- design the various kinds of compensator.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Fundamentals of Control System** Basic Concepts of Control System, Classification, System Modeling, Transfer Function, Block Diagram Representation, Signal Flow Graph, Concept of Superposition for Linear Systems with Examples	08	20
2.	**System Modelling** Translational and Rotational Mechanical, Electrical, Thermal, Hydraulic and Pneumatic Systems, Force Voltage and Force Current Analogy, Position Servo Mechanism. Block Diagram and Signal Flow Graph Representation of Physical Systems along with Rules, Properties, Comparison and Limitation, Mason's Gain Formula	08	15
3.	**Time Response and Stability Analysis** Concept of Stability, Types of Stability, Routh's Stability Criterion, Special Cases with Numerical Examples, Stability of Closed Loop System, Concept of Root Locus, Open Loop and Closed Loop Transfer Poles, Step by Step Procedure for Root Loci, Numerical Examples	07	15

Section II			
Module No.	Content	Hours	Weightage in %
4.	**Frequency Response Analysis** Need of Frequency Response Analysis, Sinusoidal Response of Linear System, Methods Used in Frequency Response, Frequency Domain Specifications	08	20
5.	**Hydraulic Control System** Basic Elements of Hydraulic Circuit, Principle Used in Hydraulic Circuit, Sources of Hydraulic Power, Integral, Derivative, PD & PID Controller With its Transfer Function, Comparison Between Hydraulic and Electrical Control System	07	15
6.	**Pneumatic Control System** Basic Elements of Pneumatic Circuit, Difference Between Pneumatic and Hydraulic Control Systems, Force Balance and Force Distance Type Controllers, Nozzle-Flapper Amplifier, PD, PI and PID Control System along with its Transfer Function.	07	15
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Control System Engineering	J.Nagrath and M.Gopal	New Age International Publishers, 5th Edition, 2007
Automatic Control Systems	Farid Golnaraghi, Benjamin C Kuo,	John Wiley & Sons, Inc., 9th Edition

Reference Book(s):

Title	Author/s	Publication
Modern Control Engineering	Ogata K.	Prentice Hall India, 2003
Modern Control Systems	Richard C. Dorf, Robert H Bishop	Pearson Education International, 12th Edition.
Control System Engineering	Norman S Nise	John Wiley & Sons, Inc., 6th Edition

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the 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 for each practical in the next turn and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 Marks.
- Practical performance/quiz/drawing/test of 15 Marks during End Semester Exam.
- Viva/Oral performance of 15 Marks during End Semester Exam.

Course Outcome(s):

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

SEME4011	CONTROL ENGINEERING
CO1	Summarized fundamentals of control systems and components of control systems
CO2	Demonstrate the methodology for modelling mechanical, hydraulic and pneumatic systems for control.
CO3	Summarize various techniques related to stability analysis of a control system.
CO4	Analyze time domain and frequency domain responses of mechanical systems.
CO5	Utilization PD, PI, PID controllers for control of physical systems.

Mapping of CO with PO

SEME4011	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1		1								
CO 2	3	2	1	1	1							
CO 3	2	2	1	1								
CO 4	2	2	1	1								
CO 5		2		1								

Mapping of CO with PSO

SEME4011	PSO1	PSO2	PSO3
CO 1	1	3	
CO 2	1	3	1
CO 3	1	3	
CO 4	2	3	1
CO 5		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	Fundamentals of Control System	1, 2
2	System Modeling	1, 2, 5, 6
3	Time Response and Stability Analysis	1, 2, 4, 5
4	Frequency Response Analysis	1, 2, 3, 4, 5
5	Hydraulic Control System	1, 2, 3, 4, 5
6	Pneumatic Control System	1, 2, 3, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4021
Course Name: Renewable Energy Sources & Systems
Prerequisite Course(s): SEME3011-Heat Transfer

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	20	30	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- identify which are the different renewable energy sources available and their national scenario.
- interpret Solar energy and related terminology along with their possible applications and conversions.
- Understand wind energy and related terminology along with their conversion to produce electricity.
- explore the geothermal and ocean energy with their possible conversions.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Renewable Energy Scenario** Scope for Renewable Energy, Advantages and Limitations of Renewable Resources, Present Energy Scenario of Conventional and Non- Conventional Resources, Government Policies, National Missions	04	10
2.	**Solar Energy** Energy Available from the Sun, Spectral Distribution, Sun-Earth Angles and their Relations, Measuring Techniques and Estimation of Solar Radiation Outside and the Earth's Atmosphere, Radiation on Tilted Surface **Solar Power Generation** Photovoltaic System for Power Generation, Types of Solar Cell Modules and Arrays, Solar Cell Types, Grid Connection, Payback Period Calculation, Advantages and Disadvantages, Site Selection and other Parameters. **Solar Applications** Conversion of Solar Energy In to Heat, Solar Thermal Collectors, Solar Concentrators Analysis and Performance Evaluation, Solar	19	40

	Energy Thermal Storage, Solar Based Devices like: Solar Pumping, Solar Cooker, Solar Still, Solar Drier, Solar Refrigeration and Air Conditioning, Solar Pond, Heliostat, Solar Furnace		
Section II			
Module No.	Content	Hours	Weightage in %
3.	**Wind Energy** Principle and Basics of Wind Energy Conversion, Energy Available from Wind, Basics of Lift and Drag, Effect of Density, Angle of Attack and Wind Speed **Wind Power Conversion** Wind Turbine Rotors, Horizontal and Vertical Axes Rotors, Drag, Lift, Torque and Power Coefficients, Tip Speed Ratio, Solidity of Turbine, Site Selection and Basics of Wind Farm, Solar-Wind Hybrid System	09	20
4.	**Bio Energy** Energy from Biomass, Sources of Biomass, Different Species, Conversion Process, Advantages and Disadvantages, Properties of Biomass, Biomass Energy **Biogas Generation** Conversion of Biomass into Fuels, Gasification and Combustion, Aerobic and Anaerobic Bio-Conversion, Types of Biogas Plants, Design and Operation, Factors Affecting Biogas Generation, Gasification, Types and Applications of Gasifiers	07	15
5.	**Geothermal energy** Availability, Vapor and Liquid Dominated Systems, Binary Cycle, Hot Dry Rock Resources, Magma Resources, Advantages and Disadvantages, Applications **Ocean Energy** Ocean Thermal Energy Conversion, Availability, Advantages and Limitations; Open, Closed and Hybrid Cycle Otec System, Wave and Tidal Energy, Estimation of Tidal Power, Tidal Power Plants, Single and Double Basin Plants, Site Requirements	06	15
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	To Prepare one mathematical model using the Sun angles relations for particular any one solar application.	06
2.	Demonstration of Solar air heater, solar cooker, Solar pyranometer, Solar collector, biogas plant, gasifier.	06
3.	To estimate the solar day time with the help of sunshine recorder.	02
4.	To perform efficiency test of solar water heater with its different parameters.	04
5.	To evaluate distilled water output under solar desalination system considering different water depth and day-night performance and calculation of payback period.	04

6.	To estimate the solar power generation using PV panel and estimation of Payback period.	04
7.	To calculate the wind power generation using the small wind mill.	04
	TOTAL	30

Text Book (s):

Title	Author/s	Publication
Solar Energy-Fundamentals, Design, Modelling and Applications.	G.N. Tiwari	Narosa Publishers
Non-conventional energy resources.	Shobh Nath Singh	Pearson India
Solar Energy	S P Sukhatme, J K Nayak	McGraw Hill

Reference Book(s):

Title	Author/s	Publication
Principles of Solar Engineering	F. Kreith and J.F. Kreider	McGraw Hill
Solar Energy thermal processes	J.A. Duffie and W.A. Beckman	J. Wiley
Wind energy Theory and Practice	Ahmed	PHI, Eastern Economy Edition
Renewable Energy Sources and Emerging Technologies	Kothari	PHI, Eastern Economy Edition

Web Material Links:

- https://nptel.ac.in/courses/112107216/ (Review of Thermodynamics)
- https://nptel.ac.in/courses/108105058/8 (Thermal Power Plants)
- https://nptel.ac.in/courses/112106133/15 (Capacity of Steam Power Plant)

Course Evaluation:

Theory:

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

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test consists of 15 marks during End Semester Exam.
- Viva/ Oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

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

SEME4021	RENEWABLE ENERGY SOURCES & SYSTEMS
CO1	Analyze the present scenario of conventional and non conventional energy in india.
CO2	Estimate the application of solar energy to develope different solar based devices in use.

CO3	Understand basics of wind energy and its use for power generation.
CO4	Relate the generation of biogas throgh different biogas plant and gasifier.
CO5	Recognize the basics of ocean, geothermal, tidal & wave energy based power plants.

Mapping of CO with PO

SEME4021	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		2	2	2	3	3	3	1	3	3		3
CO 2	2	2	3	3	3	3	3	1	3	3		3
CO 3	1	3	3	3	3	3	3	1	3	3		3
CO 4		3	3	2	3	3	3	1	3	3		3
CO 5		3	1	2	3	3	3	1	3	3		3

Mapping of CO with PSO

SEME4021	PSO1	PSO2	PSO3
CO 1	3	3	1
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

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

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

Module No	**Content**	**RBT Level**
1	Renewable Energy Scenario	1, 2
2	Solar Energy, Solar Power Generation, Solar Applications	1, 2, 3
3	Wind Energy and Wind Power Generation	1, 2, 3
4	Bio Energy and Biogas Generation	1, 2, 4
5	Geothermal energy and Ocean Energy	1, 2

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4061
Course Name: Design of Power Transmission Elements
Prerequisite Course(s): SEME3060-Design of Basic Machine Elements

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	-	-	20	30	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- learn the basics of various transmission elements involved in mechanical power transmission.
- identify various forces and its effect on power transmission.
- impart the ability for selection of proper power transmission system as per requirement.
- understand the standard data catalogue for various power transmission drives.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Design** Terminologies, Stress, Strain, Types of Forces, Various Transmission Drives, Design	02	05
2.	**Design of Flexible Elements** Design of Flat Belts and Pulleys, Selection of V Belts and Pulleys, Selection of Hoisting Wire Ropes, Design of Transmission Chains and Sprockets	06	13
3.	**Bearings** Sliding Contact Bearings- Types of Journal Bearing, Load Carrying Capacity, Methods of Lubrication, Hydrodynamic Bearing, Performance of Bearing, Mckee's Equation, Heat Dissipation and Power Loss, Summerfield Number. Rolling Contact Bearing- Types, Bearing Designation (SKF and BIS), Static Load carrying Capacity, Life of Bearing, Basic Load Rating.	07	16
4.	**Cams, Clutches and Brakes** Cam Design: Types, Pressure Angle and Under Cutting Base Circle Determination, Design of Plate Clutches, Axial Clutches, Cone Clutches, Band and Block Brakes, External Shoe Brakes, Internal Expanding Shoe Brake	07	16

Section II			
Module No.	Content	Hours	Weightage in %
5.	**Spur Gears and Parallel Axis Helical Gears** Gear Terminology, Speed Ratios and Number of Teeth, Force Analysis Tooth Stresses, Dynamic Effects, Fatigue Strength, Factor of Safety, Gear Materials, Module and Face Width, Power Rating Calculations Based on Strength and Wear Considerations Parallel Axis Helical Gears – Pressure Angle in the Normal and Transverse Plane - Equivalent Number of Teeth, Forces and Stresses	09	20
6.	**Bevel, Worm and Cross Helical Gears** Straight Bevel Gear: Tooth Terminology, Tooth Forces and Stresses, Equivalent Number of Teeth, Estimating the Dimensions of Pair of Straight Bevel Gears. Worm Gear: Merits and Demerits, Terminology. Thermal Capacity, Materials, Forces and Stresses, Efficiency, Estimating the Size of the Worm Gear Pair. Cross Helical: Terminology - Helix Angles -Estimating the Size of the Pair of Cross Helical Gears	08	17
7.	**Geartrains** Geometric Progression, Standard Step Ratio, Design of Sliding Mesh Gear Box, Design of Multi Speed Gear Box, Types of Gear Trains, Simple Gear Trains, Compound Gear Train, Reverted Gear Train, Epicyclic Gear Train	06	13
	TOTAL	45	100

List of Tutorials:

Sr. No.	Name of Tutorial	Hours
1.	Design of Flat belt and selection of V belt	02
2.	Standard Catalogue related to belt, Chain and Spocket	01
3.	Design of sliding and rolling contact bearing	01
4.	Design of single plate clutch	01
5.	Design of brakes and cams	01
6.	Design of spur gears	02
7.	Design of helical gears	02
8.	Design of bevel and worm wheel	02
9.	Standard catalogue for spur, helical and worm gears	01
10.	Design of Gear Trains	02
	TOTAL	15

Text Book(s):

Title	Author/s	Publication
Design of Machine Elements	V B Bhandari	McGraw Hill Eduction
Mechanical Engineering Design	Joseph Shigley	McGraw Hill Eduction

Reference Book(s):

Title	Author/s	Publication
Machine Design	Sundararajamoorthy T. V	Anuradha Publications
Machine Design	R S Khurmi	S Chand Publication
Hand book of Mechanical Design	Gitin Maitra	McGraw Hill Eduction

Web Material Links:

- https://nptel.ac.in/courses/112/106/112106137/

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Tests Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 marks.

Tutorial:

- Continuous Evaluation consists of solution of Practical which should be evaluated out of 10 for each Tutorial and average of the same will be converted to 20 Marks.
- Performance/Problem solution/quiz/test of 15 Marks during End Semester Exam.
- Viva/Oral performance of 15 Marks during End Semester Exam.

Course Outcome(s):

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

SEME4061	DESIGN OF POWER TRANSMISSION ELEMENTS
CO1	Select the materials for the mechanical transmission system.
CO2	Apply the design principle in designing of flexible elements, bearings, cams, clutches, brakes, gears and gear trains.
CO3	Estimate life of rolling element bearings and determine performance parameters of sliding contact bearings.
CO4	Describe the terminology of different gears and cams.
CO 5	Evaluate speed variation on gear box shafts and optimize fluctuation of shaft speeds in gear box.

Mapping of CO with PO

SEME4061	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1	1								1
CO 2	1	2	1	1	1							
CO 3	1	1		1								
CO 4	1	1	1	1								
CO 5	1	2		1	1							

Mapping of CO with PSO

SEME4061	PSO1	PSO2	PSO3
CO 1	1	3	2
CO 2	3	3	2
CO 3	3	3	2
CO 4	1	3	2
CO 5	3	3	2

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

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

Module No	Content	RBT Level
1	Introduction to Design	1, 2
2	Design of Flexible Elements	1, 2, 3, 4, 5
3	Bearings	1, 2, 3, 4, 5
4	Cams, Clutches and Brakes	1, 2, 4, 5
5	Spur Gears and Parallel Axis Helical Gears	1, 2, 5
6	Bevel, Worm and Cross Helical Gears	1, 2, 5
7	Geartrains	1, 2, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4040
Course Name: Operations Research
Prerequisite Course(s): -- SEME3090 – Industrial 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	-	01	04	40	60	-	-	50	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- provide students the knowledge of optimization techniques and approaches.
- enable the students apply mathematical, computational and communication skills needed for the practical utility of Operations Research.
- teach students about networking, inventory, queuing, decision and replacement models.
- introduce students to research methods and current trends in Operations Research.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Linear Models** Introduction to Operations Research - Linear Programming - Mathematical Formulation, Solution Techniques of LP: Graphical Methods, Analytical Methods: Simplex, Big M and Two Phase, Sensitivity Analysis, Primal and Dual Problems, Economic Interpretation	10	22
2.	**Transportation and Assignment** Transportation Problems Definition, Linear Form, Solution Methods: North West Corner Method, Least Cost Method, Vogel's Approximation Method, Degeneracy in Transportation, Modified Distribution Method, Unbalanced Problems and Profit Maximization Problems, Transshipment Problems, Assignment Problems and Travelling Sales Man Problem	06	14
3.	**Queuing Theory** Basis of Queuing Theory, Elements of Queuing Theory, Kendall's Notation, Operating Characteristics of a Queuing System, Classification of Queuing Models, Preliminary Examples of M/M/1:∞/FCFA	06	14
Section II			

Module No.	Content	Hours	Weightage in %
4.	**Inventory Control** Inventory Models, Various Costs and Concepts EOQ, Deterministic Inventory Models, Production Models, Stochastic Inventory Models, Buffer Stock	05	10
5.	**Decision Models** Game theory – Two-person Zero Sum Game, Graphic Solution - Property of Dominance, Algebraic solution Replacement Models - Items that deteriorate with Time, when Money Value Changes, Items that failed completely — Individual Replacement and Group Replacement	09	20
6.	**Sequencing and Networks** Sequencing — Problem with N jobs and 2 machines - 3 machines and 'M' machines Network Models — Basic Concepts, Construction of Networks, Project Network, CPM and PERT - Critical Path Scheduling, Crashing of Network	09	20
	TOTAL	45	100

List of Tutorial:

Sr No	Name of Practical	Hours
1.	Exercise on definition, formulation of linear programing problems.	02
2.	Exercise on Graphical solution of linear programing problems	02
3.	Exercise and case problems on Simplex, Big M and Two-phase LP Problems	01
4.	Exercise and case problems on Dual and Primal LP Problems	01
5.	Exercise and case problems on Sensitivity Analysis	01
6.	Exercise and case problems on Transportation and Transhipment Problems.	01
7.	Exercise and case problems on Assignment and Travelling sales man Problems	02
8.	Exercise and case problems on Queuing theory	01
9.	Exercise and case problems on Game theory	01
10.	Exercise on Inventory model	01
11.	Exercise on Replacement theory	01
12.	Exercise and case problems on PERT/CPM	01
	TOTAL	15

Text Book(s):

Title	Author/s	Publication
Operations Research	Kanti Swarup, Gupta PK, and Manmohan	S. Chand & Sons
Operations Research: An Introduction	Hamdy Taha	Pearson

Reference Book(s):

Title	Author/s	Publication
Operations Research	P Mariappan	Pearson
Operations Research	H N wagner	Prentice hall
Optimization in Operations Research	Ronald Rardin	Pearson Education Inc
Quantitative Techniques in Management	N D Vohra	Tata McGraw-Hill

Web Material Links:

- www.nptel.ac.in/

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 Marks.

Tutorial:

- Continuous Evaluation consists of Performance of Tutorial which should be evaluated out of 10 for each Tutorial and average of the same will be converted to 20 Marks.
- Internal Viva component of 30 Marks.

Course Outcome(s):

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

SEME4040	OPERATIONS RESEARCH
CO1	Formulate and solve the linear programming problems.
CO2	Compile optimal solutions by using various transportation and assignment methods.
CO3	Apply various methods to select and execute various optimal strategies to win the game.
CO4	Compute the eoq for minimizing total inventory cost, discount model, and replacement time of assets.
CO5	Construct a network for case problems of CPM/PERT.

Mapping of CO with PO

SEME4040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	2	1							3
CO 2	2	3	2	2	1							2
CO 3	2	3	2	2	1							1
CO 4	2	3	2	2	1							3
CO 5	2	3	2	2	1						3	3

Mapping of CO with PSO

SEME4040	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	2	3
CO 3	3	2	3
CO 4	3	2	3
CO 5	3	2	3

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

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

Module No	Content	RBT Level
1	Linear Models	1, 2, 4, 5
2	Transportation and Assignment	1, 2, 4, 5
3	Queuing Theory	1, 2, 4, 5
4	Inventory Control	1, 2, 4, 5
5	Decision Models	1, 2, 4, 5
6	Sequencing and Networks	1, 2, 4, 5

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME4920
Course Name: Project/Training
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	
-	24	-	23	-	-	200	300	-	-	500

CE: Continuous Evaluation, ESE: End Semester Exam

Outline of the Course:

Project

- The project will be aligned with the aims of the engineering programme and its areas of specialization and shall be based on the recent trends in technology.
- The student shall carry out a comprehensive project at relevant academic / R&D / industrial organization.
- The student is required to submit a project report based on the work carried out.

Training

- The aim of this course is to use the internship experience to enable students to develop their engineering skills and practices.
- The student will be placed in industry/organization for 12 to 18 weeks and assessed for academic credit.
- The students may select industry on their own or one which is offered by institute.
- Students are expected to experience a real-life engineering workplace and understand how their engineering and professional skills can be utilized in industry.
- The student is required to submit a project report based on the work carried out.

Course Outcome(s):

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

SEME4920	PROJECT/ TRAINING
CO 1	Support the theoretical learning with practice and integrate knowledge for engineering applications
CO 2	Adapt to real time industry exposure and experience
CO 3	Solve challenging projects for commercial, societal and environment benefit.
CO 4	Explain the importance of planning, documentation, punctuality and work ethics.
CO 5	Document the work which is carried out in proper format with industry standards.

Mapping of CO with PO

SEME4920	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	3	3	3	3	3	3	3	1	2
CO 2	2	3	2	3	3	3	3	3	3	3	1	2
CO 3	2	3	2	3	3	3	3	3	3	3	1	3
CO 4	2	3	2	3	3	3	3	3	3	3	1	2
CO 5	2	3	2	3	3	3	3	3	3	3	1	3

Mapping of CO with PSO

SEME4920	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

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

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

Module No	Content	RBT Level
1	Identify suitable project area/training company based on sub-field of choice	1,2, 3
2	Understand the current level of technology/operations	1,2, 3, 4, 5
3	Identify bottlenecks in technology/operations	1, 2, 3, 4, 5
4	Propose & validate solutions	1, 2, 3, 4, 5, 6
5	Proper documentation of solutions.	1, 2, 3, 4, 5, 6

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3591
Course Name: Fuels and Combustion
Prerequisite Course(s): -- SEME3121 – Internal Combustion Engines

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
- learn about different types of fuels.
- learn about the importance of fuels in various applications.
- learn about combustion of fuels and equipment required for combustion.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Classification and Properties of Fuels** Fuels-Types and characteristics of fuels-determination of properties of fuels. Fuel analysis-Proximity and ultimate analysis-Calorific value (CV). Gross and net calorific values (GCV, NCV). Bomb calorimetry-empirical equations for CV estimation.	08	20
2.	**Solid Fuels** Origin of coal. Ranking of coal. Washing, cleaning and storage of coal. Renewable solid fuels, comparative study of solid, liquid and gaseous fuels, selection of coal for different industrial applications, carbonization of coal.	10	20
3.	**Liquid Fuels** Origin of crude oil, composition of crude petroleum, classification of crude petroleum, removal of salt from crude oil, processing of crude petroleum, fractionation distillation, ADU and VDU, cracking, hydrotreatment and reforming	07	10
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Gaseous Fuels** Rich and lean gas, wobbe index, natural gas, dry and wet natural gas, foul and sweet NG, LPG, LNG, CNG, Methane, producer gas,	10	25

	water gas, coal gasification, gasification efficiency.		
5.	**Combustion** General principles of combustion, types of combustion processes, combustion chemistry, combustion equations, kinetics of combustion, combustion of solid fuels, combustion calculations, air fuel ratio, excess air calculations. **Combustion equipments** Analysis of fuel gases by orsat apparatus, combustion of solid fuels, grate firing and pulverized fuel firing systems, fluidinzed bed combustion, circulating fluidized bed boiler, burners, factors affecting burners and combustion.	10	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Principle of combustion, 2nd edition	K. K. Kenneth	Wiley publication, USA, 2012
Fuels-solid, liquid and gases-Their analysis and valuation	H.J. Philips	Foster Press, USA, 2010

Reference Book(s):

Title	Author/s	Publication
The chemistry and technology of coal	J G Speight	Taylor and Francis Ltd., US 2016
Fuels and combustion	S Sarkar	University Press, India, 2009

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3591	FUELS AND COMBUSTION
CO 1	Differentiate between various fuels.
CO 2	Categorize the importance of fuels and its application.
CO 3	Understand the control of emissions in combustion.
CO 4	Describe the concept of combustion equipments.

Mapping of CO with PO

SEME3591	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1	2	3	1	3	3	1		3		3
CO 2	2	2	3	3	3	3	3	1		3		3
CO 3	2	3	3	3	3	3	3	1		3		3
CO 4	2	3	3	3	3	3	3	1		3		3

Mapping of CO with PSO

SEME3591	PSO1	PSO2	PSO3
CO 1	3	3	2
CO 2	3	3	3
CO 3	3	3	3
CO 4	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	Thermal Power Plant	1, 2, 3, 5
2	Economics of Power Generation	1, 2, 3, 4, 5
3	High Pressure Steam Generators	1, 2, 3, 4, 5
4	Coal and Ash Handling Systems	1, 2, 6
1	Draught System	1, 2, 3, 5
2	Nuclear and Hydro Power Plant	1, 2, 3, 4, 5
3	Feed Water Treatments	1, 2, 4, 5
4	Condenser and Cooling Tower	1, 2, 3

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3620
Course Name: Production Management
Prerequisite Course(s): -- SEME4040 – Operations Research, SEME3090 – Industrial 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 acquaint the students with decision making in Planning, Scheduling and control of Production functions in both manufacturing and services.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Production function – an Introduction** Definitions and types of production systems. Strategic Management – corporate strategies, production strategies, World class manufacturing, demand forecasting for Operations	08	20
2.	**New product development** Product Design, New product development, process planning and design, value analysis, capacity planning.	10	20
3.	**Plant location and layout** Plant location, factors influencing plant location, Plant layout-classification of layout with advantages, layout design procedures, Production planning and control – aggregate planning-nature, Strategies, methods, Master production Plan.	07	10
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Quality control** Quality control-Definition, need, Quality control techniques, control charts, acceptance sampling, six sigma, and quality circles. TQM-scope, benefits, JIT	10	25
5.	**Flexible manufacturing system** Flexible Manufacturing Systems. Pokayoke-Characteristics, levels, classification, principles, device. Kaizen-Elements, classification, steps in implementing kaizen.	10	25

	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Production and Operations Management	R. Panneerselvam	PHI learning.
Production and operations Management	Martin K. Staff	Cengage learning.
Production & operation & Management	V.K. Khurana	ANE books

Reference Book(s):

Title	Author/s	Publication
Production and Operations management with solution manual	Kanishka bedi	Oxford University press, Chennai
Production and operations management	R.B. Khanna	PHI learning private ltd

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3620	PRODUCTION MANAGEMENT
CO 1	Understand various production systems and management principles, corporate and production strategies.
CO 2	Become familiar with the planning and designing of production processes
CO 3	Understand the critical factors in plant location and layout design, apply production planning and control techniques
CO 4	Develop understanding of various quality control
CO 5	Become familiar with Flexible Manufacturing Systems and delve into the principles of Pokayoke as well as Kaizen elements

Mapping of CO with PO

SEME3620	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2		1			3	1	2	2	3	3	2
CO 2	1	1	1	1		2	2	3	1	3	3	2
CO 3	2	2	2	1		3	1	2	2	2	3	2
CO 4	2	1	1	1		2	1	2	2	2	3	2
CO 5	1	3	2	2		2	1	2	1	2	3	2

Mapping of CO with PSO

SEME3620	PSO1	PSO2	PSO3
CO 1	2	**2**	1
CO 2	3	2	2
CO 3	2	2	2
CO 4	1	2	2
CO 5	2	2	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	Management and its evaluation	1, 2, 3, 5
2	Apparel production planning and control	1, 2, 3, 4
3	Terminology for apparel production planning	1, 2, 3,
4	Kinds of manufacturing system	1, 2, 3
5	Planning, Production planning and work allocation	1, 2, 3
6	Production Activities	1, 2, 3

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3530
Course Name: Estimation & Costing
Prerequisite Course(s): -- SEME4040 – Operations Research

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
- provide deep study of the costing principles, techniques and cost component.
- address the underlying concepts, methods and application of Engineering Costing & Estimating.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Costing & Estimation** Definition, Scope, Objectives & Significance, Cost Objects, Cost Centers & Cost Units, Classification of Cost, Types of Estimate, Standard Data, Methods of Estimates	04	05
2.	**Cost Ascertainment – Element of Cost** **Material Cost** – EOQ, Safety Stock, Minimum level, Maximum Level, Re-order Quantity, Types of inventory control systems, Valuation by FIFO, LIFO etc., Illustrative Example **Labour Cost** - Methods of wage payments for direct and indirect labour, Piece rate system, Wage incentives: different plans, Illustrative Example **Overheads** – Collection, Classification, Apportionment, Absorption treatment of overhead, Illustrative Example	07	15
3.	**Marginal Costing** Depreciation – Purpose & Method - straight line method, Diminishing balance method, Break-even analysis, Margin of safety, Application of marginal costing for decision making, Illustrative Example	07	20
4.	**Budget and Budgetary Control** Concepts, Types of Budgets, Budgetary Control, Preparation of Budgets, Illustrative Example	04	10
Section II			

Module No.	Content	Hours	Weightage in %
5.	**Cost Estimation of Forging Shop** Losses in forging, Forging Cost, Illustrative Example **Cost Estimation of Foundry Shop** Estimation of pattern cost, Foundry losses, Steps for Finding Costing cost, Illustrative Example	09	20
6.	**Cost Estimation of Fabrication Shop** Weldments & Welded joints, Welding Cost, Illustrative Example	05	10
7.	**Time & Cost Estimation of Machine Shop** Estimation of machining time for lathe operations, Estimation of machining time for drilling, boring, shaping, planning, milling and grinding operations, Illustrative Example	09	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Mechanical Estimating and Costing	B.P. Sinha	Tata McGraw Hill Publishing Co. Ltd. N. Delhi
Mechanical Estimating and Costing	T.R. Banga and S. C. Sharma	Khanna Publishers, Delhi-6

Reference Book(s):

Title	Author/s	Publication
Industrial Engineering & Operations management	S. K. Sharma & Savita Sharma	Kataria publishers
Process Planning & Cost Estimation	R. Kesoram, C. Elanchezhian & B. Vijaya Ramnath	New age international publication
Process Planning & Cost Estimation	M. Adithan	New age international publication

Course Evaluation:

Theory:

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

Course Outcome(s):

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

SEME3530	COST ESTIMATION FOR ENGINEERS
CO 1	Identify different areas of Engineering Costing & Estimating.
CO 2	Analyze the applications of all the areas in day to day life.
CO 3	Apply cost estimating in decision making.
CO 4	Develop the concept of budgetary control.

Mapping of CO with PO

SEME3530	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1	1	2		2			3	1	3	1
CO 2	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	2	3	3	3	3	3	3	1	3	3

Mapping of CO with PSO

SEME3530	PSO1	PSO2	PSO3
CO 1	2	3	
CO 2	3	3	
CO 3	3	3	3
CO 4	3	3	3
CO 5			

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

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

Module No	Content	RBT Level
1	Costing & Estimation	1, 2, 3, 4
2	Cost Ascertainment-Element of Cost	1, 2, 3, 4
3	Marginal Costing	1, 2, 3, 4
4	Budget and Budgetary Control	1, 2, 3, 4, 5
5	Cost Estimation of Forging and Foundry Shop	1, 2, 3, 4, 5
6	Cost Estimation of Fabrication Shop	1, 2, 3, 4 , 5
7	Time & Cos Estimation of Machine Shop	1, 2, 3, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3610
Course Name: Product Development & Value Engineering
Prerequisite Course(s): -- SEME4040 – Operations Research, SEME3090 – Industrial 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
- learn about product design.
- learn about manufacturing and assembly and able to select materials for product design.
- learn about the customer needs for product for value engineering services.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Product Design** Introduction, Product life cycles, characteristics of successful product development, design and development of products, types of design and redesigns, engineering designs, duration and cost of product development, the challenges of product development.	08	20
2.	**Product Design for Manufacturing and Assembly** Methods for designing for manufacturing and assembly, design for maintainability, design for environment, legal factors and social issues, engineering ethics and issues of society related to design of products, design for safety, vision and illumination design, climate, noise, motion, sound and vibration, product costing.	10	20
3.	**Product Analysis and Material Selection** Tools and charts used for product analysis like bill of materials, gozinto chart, performance characteristics of materials, material selection process, sources of information on material properties, economics of materials, evaluation methods for material selection.	07	10
Section II			
Module No.	Content	Hours	Weightage in %

4.	**Identifying Customer Needs** Customer satisfaction, voice of customer, customer populations, types of customer needs, customer need models, gathering customer needs: Need gathering methods, conducting interviews, like dislike method, articulated-used method, product feel and industrial design, organizing and prioritizing needs, grouping interpreted needs, affinity diagram, determining need importance, customer use patterns, customers need documentation.	10	25
5.	**Value Engineering** Definition, value engineering function, approach of function, evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, evaluation of value, FAST diagramming. Case studies on product design development and value engineering.	10	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Product Design	Kevin Otto, Kristin Wood	Pearson Education Inc.
Product design and development	K.T. Ulrich and S.D. Eppinger	Tata McGraw Hill

Reference Book(s):

Title	Author/s	Publication
Product development	Chitale & Gupta	Tata McGraw Hill
The mechanical process design	David Ullman	McGraw Hill Inc.
Engineering Design Process	Yousef Haik	T M M Shahin, Cengage Learning
Product design & Process Engineering	Niebel and Deeper	McGraw Hill
Value Management	Heller	Addison Wasley
Value Engineering: A systematic approach	Arthur E. Mudge	McGraw Hill
New Product Development	Timjones, Butterworth Heinmann	Oxford
Assembly automation and product design	Geoffrey Boothroyd	CRC Taylor & Francis

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3610	PRODUCT DEVELOPMENT VALUE ENGINEERING
CO 1	Interpret product design and development process.
CO 2	Contrast and frame customer specification to configure product with function.
CO 3	Choose product architecture and virtual prototyping.
CO 4	Understand contemporary issues and their impact on provided solution.
CO 5	Solve open ended problem belongs to design engineering that meet the requirements.

Mapping of CO with PO

SEME3610	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1	1	1	1			1	1	1	1	
CO 2	2	3	2	2	1		2	1		1	1	1
CO 3	2	1	1	2	2	2	2	1	1	2	1	1
CO 4	2	2	3	2	2		2	3	1	2	2	2
CO 5	1	3	2	2	3	2	3	1		3	2	2

Mapping of CO with PSO

SEME3610	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	1	1	1
CO 3	3	1	1
CO 4	2	3	3
CO 5	3	3	3

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

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

Module No	Content	RBT Level
1	Product Design	1, 2, 3, 5, 6
2	Product Design for Manufacturing and Assembly	1, 2, 3, 4, 5, 6
3	Product Analysis and Material Selection	1, 2, 3, 4, 5, 6
4	Identifying Customer Needs	1, 2, 3, 4
5	Value Engineering	1, 2, 3, 4

School of Engineering

Department of Mechanical Engineering

Course Code: SEME3602
Course Name: Gas Dynamics
Prerequisite Course(s): -- SEME2060 - Fluid Mechanics, SEME3101 - Power Plant 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

- learn about basic concepts of gas dynamics
- learn about how the gas behaves in different operating conditions
- learn about basics of compressible flow
- learn about application of gas dynamics in various mechanical systems

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Fundamentals of compressible flow:** Ideal gas relationship, The adiabatic energy equation, Mach number and its significance, Mach waves, Mach cone and Mach angle, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility, Area velocity relationship.	08	20
2.	**One Dimensional Isentropic flow:** General features of isentropic flow, performance curve, Comparison of adiabatic and isentropic process, One dimensional isentropic flow in ducts of varying cross-section- nozzles and diffusers, operation of nozzles under varying pressure ratio, mass flow rate in nozzles, critical properties and choking, area ratio as function of Mach number, Impulse function, non-dimensional mass flow rate in terms of pressure ratio, area ratio and Mach number, Working charts and gas tables, Application of Isentropic flow	10	20
3.	**Flow in constant area duct with heat transfer (Rayleigh flow):** Simple heating relation of a perfect gas, Rayleigh curve and Rayleigh flow equations, variations of flow properties, maximum	07	10

	heat transfer, tables and charts for Rayleigh flow.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Normal shock Waves:** Development of shock wave, Thickness of shock wave, governing equations, Strength of shock waves, Prandtl-Mayer relation, Rankine-Hugoniot relation, Mach number in the downstream of normal shock, variation of flow parameters across the normal shock, normal shock in Fanno and Rayleigh flows, impossibility of a rarefaction shock, supersonic diffusers, supersonic pitot tube.	10	25
5.	**Flow in constant area duct with friction (Fanno flow):** Fanno curve and Fanno flow equations, solution of Fanno flow equations, variation of flow properties, variation of Mach no. with duct length, isothermal flow in constant area duct with friction, tables and charts for Fanno flow, Experimental friction coefficients.	10	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Fundamental of Compressible flow	S. M. Yahya	New Age International Publication
Fundamentals of compressible fluid dynamics	P. Balachandran	PHI Learning, New Delhi

Reference Book(s):

Title	Author/s	Publication
Gas Dynamics	E. Rathakrishnan	PHI Learning, New Delhi
Gas Dynamics and Jet Propulsion	P. Murugaperumal	Scitech Publication, Chennai.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3602	GAS DYNAMICS
CO 1	Understand the fundamentals of compressible flow
CO 2	Formulate and develop the flow parameters for isentropic flow.
CO 3	Analyze the effect of normal shock in compressible flow.
CO 4	Study the effect of friction on compressible flow in constant area duct.
CO 5	Study the flow through constant area duct with heat transfer

Mapping of CO with PO

SEME3602	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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

Mapping of CO with PSO

SEME3602	PSO1	PSO2	PSO3
CO 1	2	3	
CO 2	2	3	2
CO 3	3	3	
CO 4	2	3	
CO 5	2	3	

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

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

Module No	**Content**	**RBT Level**
1	Fundamentals of compressible flow	1, 2, 3, 5
2	One Dimensional Isentropic flow	`1, 2, 3, 4, 5
3	Flow in constant area duct with heat transfer (Rayleigh flow)	1, 2, 3, 3, 5
4	Normal shock Waves	1, 2, 3, 5
5	Flow in constant area duct with friction (Fanno flow)	1, 2, 3, 5

School of Engineering

Department of Mechanical Engineering

Course Code: SEME3570
Course Name: Mechatronics
Prerequisite Course(s): - SEME4011 – Control Engineering,
SESH1240 – Electrical & Electronics 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	-	-	03	40	60	-	-	-	-	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- Understand applications signal processing, sensors, actuators.
- Apply the importance of mechatronics systems.
- Understand the importance of maintenance and safety in Robotics systems.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Control devices-Meaning, need and application. Open loop control. Closed loop control Sinking and sourcing concept.	04	08
2.	**Signal Processing** Signal processing- Need and meaning. Data acquisition Sampling. Digitized signal. Sampling rate. Nyquist frequency. Aliasing. Analog to digital signal conversion. Digital to analog signal conversion	06	14
3.	**Sensors** Sensors- Need and classification. Important parameters (such as sensitivity, linearity, range, response time, accuracy, repeatability, Resolution, threshold value etc.) Its definitions and Importance in sensor Selection. Working and application of sensing technique for following parameter. i. Position and speed. ii. Stress, strain. iii. Temperature. iv. Pressure. v. Flow and level. vi. Vibration vii. Acoustic viii. Optical ix. Object detection. Selection criteria for sensors. Common troubles and remedies in sensor operations.	08	18
4.	**Actuators** Definition, need, working, applications. Electrical actuator (working and application). i. DC motors – series, shunt and	04	08

	compound. ii. Ac Single-phase motor. AC poly phase motor. iv. Servo Motor v. Stepper motors. Hydraulic & Pneumatic actuators (working and application) i. Types of Cylinder. ii. Direction control valve. Precautions in handling / operating actuators. Selection criteria. Common troubles and remedies.		
Section II			
Module No.	Content	Hours	Weightage in %
5.	**Mechatronic Systems** Introduction. Design steps and considerations. Various mechatronics systems. i. Being used in day-to-day life. ii. Expected use in future. Working elements ,its functions and applications of following system. i. Hydraulic robot arm. ii. DC motor based bottle filling. iii. Temperature sensing system. Mechatronics systems, which are in recent trend.	11	25
6.	**Robotics Applications, Maintenance and Safety** Applications of robots (including special types). Robot maintenance: Need and types. Common troubles and remedies in robot operation. General safety norms, aspects and precautions in robot handling	12	27
	TOTAL	45	100

Text Book (s):

Title	Author/s	Publication
Mechatronics-Electronics Control Systems in Mechanical and Electrical Engineering	W.Boltong Pearson	Tata McGraw Hill Education
Mechatronics	Ganesh Hedge	Jones & Bartlett

Reference Book(s):

Title	Author/s	Publication
Robotics-Control, Sensing, Vision and Intelligence	Ralph Gonzalez, C.S.G. Lee, K.S. Fu	Tata McGraw Hill Education
Industrial Robotics	Roger N Nagel, M.P. Groover, N.G. Odrey, Michell Weiss	Tata McGraw Hill Education

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3570	MECHATRONICS
CO 1	Understand the basic concept of signal processing.
CO 2	Understand the working principle of sensors and actuators.
CO 3	Define and identify various mechatronics systems.
CO 4	Understand the importance of maintenance and safety of Robotics.

Mapping of CO with PO

SEME3570	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	2	3	1	2	1		1	2		3
CO 2	3	2	2	2	2		2		1	2		2
CO 3	2	2	2	3	1	2	3	3		3	2	2
CO 4	2	2	3	3	3	2	3	1	1	3	2	2

Mapping of CO with PSO

SEME3570	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	2	2	2
CO 3	3	2	2
CO 4	3	3	3
CO 5			

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

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

Module No	Content	RBT Level
1	Introduction	1, 2, 3
2	Signal Processing	1, 2, 3, 5
3	Sensor	1, 2, 3
4	Actuators	1, 2, 3
5	Mechatronics Systems	1, 2, 3, 4
6	Robotics Applications, Maintenance and Safety	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3581
Course Name: Plastics, Ceramics and Composites
Prerequisite Course(s): SEME2020 - Material Science and Metallurgy,
SEME2050 – Forming & Machining Processes,
SEME3051 – Production Technology,

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
- understand the concept of plastic, ceramic and composite material.
- know processing of plastics and ceramics materials.
- identify different manufacturing process for composite material.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Polymeric materials and comparison with other engineering materials. Plastic, Thermoplastic and Thermosets, Elastomers and polymers.	04	10
2.	**Processing of plastics and rubbers** Introduction to injection moulding, rotational moulding, extrusion, blow moulding, plastic film blowing, compound moulding, resin transfer moulding, resin injection moulding, designing with plastics and rubbers.	09	20
3.	**Fabrication and decorating of plastics** Machining of plastics, turning, drilling, sawing, threading, post - moulding techniques, hot stamping, metallic coatings, electroplating, printing, vacuum metalizing and some case studies**.**	09	20
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Ceramic materials** Atomic bonding and crystal structure in ceramics, conventional ceramics and glass structure, refractory and insulating materials,	08	15

	physical, thermal, electrical, magnetic, optical and piezoelectric properties, Differentiation from other engineering materials, Time temperature and environmental effect on properties of ceramics.		
5.	**Processing of ceramics** Phase Equilibrium Diagram, Gibbs phase rule, advanced structural ceramics, synthesis and processing of ceramics, sintering process, powder pressing and sintering fabrication processes, Sintering defects, slip casting, ceramic injection moulding, tape casting, properties & applications of ceramics and material selection.	07	15
6.	**Composite materials** Merits & demerits of composites, application of composite, manufacturing processes of composites, Property evaluation of composites.	08	20
	TOTAL	45	100

Reference Book(s):

Title	**Author/s**	**Publication**
Plastic Process Engineer	Throne James L.	Marcel Dekker, New York, 1979.
Engineering Design of Plastics and Rubber	Crawfard R.J	Woodhead Publication, U.K, 1985
Modern Ceramic Engineering, Properties, Processing and Use in Design	Richerson David	Marcel Dekker, 1987
Engineering Materials and their Applications	Flinn R.A. and Trojan P.K.	Jaico Publishing House, 1999.
Introduction to Ceramics	Kingery W.D, Bowen H. K and Uhlman D.R.	John Wiley & Sons, 1975.

Course Evaluation:

Theory:

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

Course Outcome(s):

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

SEME3581	**PLASTICS, CERAMICS & COMPOSITES**
CO 1	Know the different processes and bedecking of plastics and rubbers.
CO 2	Apply the knowledge and applications of ceramics in material selection.
CO 3	Understand application of composite materials.
CO 4	Identify materials for different applications.

Mapping of CO with PO

SEME3581	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1	2			1		1	2		
CO 2	3	3		2	1							1
CO 3	2	2		3	3	3			1	3	1	1
CO 4	2	2	1	2			3		1	2		

Mapping of CO with PSO

SEME3581	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	2	3	
CO 3	3	3	2
CO 4	2	2	
CO 5			

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

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

Module No	Content	RBT Level
1	Introduction	1, 2, 3
2	Processing of Plastic and Rubbers	1, 2, 3, 5
3	Fabrication and decorating of plastics	1, 2, 3
4	Ceramic materials	1, 2, 3
5	Processing of ceramics	1, 2, 3, 4
6	Composite materials	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3541
Course Name: Design of Pressure Vessel & Piping
Prerequisite Course(s): -- SECV2102 – Advanced Solid Mechanics,
SEME3060 – Design of Basic Machine Elements,
SEME4061 – Design of Power Transmission Elements

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
- learn about design of pressure vessels and piping systems.
- learn to use of various standards used for the pressure vessel design.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Stresses in Pressure Vessel** Introduction to stresses in pressure vessel and its application to shells and end closures, stresses in circular plate, Thermal stresses, stresses in plate having the circular hole due to bi-axial loading, excessive elastic deformation, plastic instability, brittle, rupture and creep.	08	20
2.	**Pressure vessel design code** Introduction to ASME code for pressure vessel design, pressure vessel and related components design using ASME codes, design of nozzle.	10	20
3.	**Supports design for Pressure vessel** Design of base plate and support lugs, allowable stresses, design of saddle supports.	07	10
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Other design consideration in pressure vessel** Buckling phenomenon, Elastic buckling of circular ring and cylinders under external pressure, collapse of thick walled cylinders or tubes under external pressure, effect of supports on	10	25

	elastic buckling of cylinders, design of circumferential stiffness, buckling under combine external pressure and axial loading, fatigue, shock high pressure high temperature irradiation corrosion and other hostile environments, high strength, light weight pressure vessels resistant to external high pressures found in undersea exploration.		
5.	**Piping design for pressure vessel** Flow diagram, piping layout and piping stress analysis, flexibility factor and stress intensification factor, design of piping as per B31.1 piping code, piping components: bends, tees bellows and valve. Types of piping supports and the behaviour, Introduction to piping codes and standards.	10	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Pressure vessel design	J F Harvey	CBS publication
Process equipment design	L E Brownell	Wiley Eastern Ltd., India

Reference Book(s):

Title	Author/s	Publication
ASME Pressure Vessel and Boiler Code, Section VIII Div 1,2 and 3	-	-
Pressure vessel design handbook	Henry H Bednar	CBS publishers and distributors
Chemical Process equipment, selection and design, Butterworths, Series in Chemical Engineering, 1988	Stanley M Wales	-
Pressure Vessels: ASME Code Simplified	J Philip Ellenberger	-
Fundamentals of piping design	P Smith	Elsevier

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3541	DESIGN OF PRESSURE VESSEL & PIPING
CO 1	Analyse thin plates and shells for various types of stresses.
CO 2	Understand and evaluate the terms involved for the design of pressure vessel and piping.
CO 3	Develop shells, end closures and nozzles of pressure vessels using asme codes.
CO 4	Analyse and examine piping systems.

Mapping of CO with PO

SEME3541	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	3	3	3	2	1		2		
CO 2	3	3	3	3	3	3	2	1		2	1	
CO 3	3	3	3	3	2		2	1		2	2	1
CO 4	2	3	2	2	1			1		1	1	

Mapping of CO with PSO

SEME3541	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	0	3	3
CO 3	3	3	3
CO 4	0	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.	Stresses in Pressure Vessel	1, 2, 3, 4, 5, 6
2.	Pressure vessel design code	1, 2, 3, 4
3.	Supports design for Pressure Vessel	1, 2, 3, 4, 5
4.	Other design consideration in pressure vessel	1, 2, 4, 5
5.	Piping design for Pressure vessel	1, 2, 3, 4, 5, 6

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3512
Course Name: Advance Manufacturing Technology
Prerequisite Course(s): SEME2030 - Non-Cutting Manufacturing Processes, SEME2050 - Forming & Machining Processes, SEME3051 – Production Technology

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
- learn the principles of material removal mechanism of nontraditional processes.
- provide depth knowledge in selection of advanced machining process to fabricate intricate and complex shapes in difficult to machine material.
- provide awareness of advanced Nano and additive manufacturing techniques.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Trends in modern manufacturing; characteristics and classification of modern manufacturing methods, considerations in the process selection.	02	05
2.	**Mechanical Advanced Machining Processes** Introduction, principle, process description, process capabilities, material removal mechanism, parametric analysis, tool design, limitations, and applications of Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), Water Jet Machining (WJM) and Abrasive Water Jet Machining (AWJM) processes.	12	25
3.	**Electro-Chemical Processes** Fundamental principle of ECM process, Chemistry of the ECM processes, process capabilities, determination of material removal rate, surface finish and accuracy, limitations, and applications of Electrochemical Machining (ECM), Electrochemical Grinding (ECG), Electrochemical deburring, Electrochemical honing and Chemical Machining (CM) processes.	08	20

Section II			
Module No.	Content	Hours	Weightage in %
4.	**Thermal Metal Removal Processes** Electrical Discharge Machining (EDM): Working principle, process description, process capabilities, power circuits, mechanism of material removal, selection of tool electrode and dielectric fluid, limitations, and applications. Wirecut electro discharge machining, powder mixed electro discharge machining process. Laser Beam Machining (LBM): Working principle, type of lasers, machining applications of lasers, mechanism of material removal, shape and material, applications and limitation. Electron Beam Machining (EBM): Generation and control of electron beam, EBM systems, process analysis & characteristics, mechanism of material removal, shape and material, applications and limitations. Plasma Arc Machining (PAM) and Ion Beam Machining (IBM): Process principle, analysis and characteristics of process, mechanism of material removal, shape and material, applications and limitations.	10	30
5.	**Hybrid Machining** Concept, classification, process capabilities, and applications of various hybrid machining methods based on USM, EDM, ECM, etc.	04	7
6.	**Micromachining Processes** Introduction to micro machining methods; material removal mechanism and process capability of micro machining methods like micro -turning, micro-milling, micro-drilling, micro EDM, micro- WEDM, micro ECM, etc. ultra-precision machining, electrolytic in-process dressing and grinding.	05	7
7.	**Additive Processes:** Introduction to additive manufacturing processes, classification, laminated object manufacturing process, adhesive manufacturing process, and digital manufacturing process.	04	6
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Introduction to micro machining	V. K. Jain	Narosa publishing house, New Delhi
Nonconventional machining	P. K. Mishra	Narosa publishing house, New Delhi
Modern Machining Processes	P. C. Pandey	Tata McGraw Hill, New Delhi

Reference Book(s):

Title	Author/s	Publication
Advanced Machining processes	V. K. Jain	Allied publishers, New Delhi
Nontraditional manufacturing processes	G. Benedict	Marcel Dekker, New York
Advanced methods of machining	J. A. McGeough	Chapman & Hall, London
Manufacturing Scienc	A. Ghosh and A. K. Malli	East-West Press, New Delhi

Course Evaluation:

Theory:

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

Course Outcome(s):

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

SEME3512	ADVANCE MANUFACTURING TECHNOLOGY
CO 1	Identify suitable manufacturing process for advanced materials and manufacturing complication.
CO 2	Explain and deal with sophisticated and advanced equipment such as IBM, EBM, PAM, Waterjet machine etc.
CO 3	Understand the micro machining processes.
CO 4	Apply the additive manufacturing concept in ear of industry 4.0.

Mapping of CO with PO

SEME3512	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	2	3	3	2	1	1	2	3	1	1
CO 2		2	1	1					2	3		1
CO 3		2	2	1					1	2		1
CO 4	2	2	3	3	3	2	1	1	3	3	1	1

Mapping of CO with PSO

SEME3512	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	3	2
CO 3	1	2	2
CO 4	2	3	2

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

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

Module No	Content	RBT Level

1.	Mechanical Advanced Machining Processes	1, 2, 3, 4
2.	Electro-Chemical Processes	1, 2, 3, 4
3.	Thermal Metal Removal Processes	1, 2, 3, 4,
4.	Hybrid Machining	1, 2, 4
5.	Micromachining Processes	1, 2, 3, 4, 5, 6
6.	Additive Processes	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3521
Course Name: Applied Thermodynamics
Prerequisite Course(s): - SEME2011 – Engineering Thermodynamics, SEME3130 – HVAC Systems

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
- Know the properties of gases and mixture.
- Understand psychrometry chart.
- Identify different refrigerants for refrigeration cycles.
- Explain air and actual fuel cycles.
- Understand IC engine emission.
- Relate compressible flow.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Properties of gases and gas mixture** Avogadro's law, equation of state, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart, internal energy; enthalpy and specific heat of a gas mixtures.	04	10
2.	**Psychrometry** Dalton's law of partial pressure, Properties of moist air, temperature and humidity measuring instruments, psychrometric chart, psychrometric processes such as sensible heating and cooling, heating and humidification cooling and dehumidification, chemical dehumidification, adiabatic saturation.	05	10
3.	**Refrigerant and Refrigerating cycles** Classification, nomenclature and desirable properties of refrigerant, secondary refrigerants, ODP and GWP, Compound compression with intercooler, flash gas removal and flash intercooler, Desirable characteristics of refrigerant absorbent pair for vapor absorption cycle, Simple H2O -NH3 cycle, LiBr2 – H2O cycle and its working.	10	20

4.	**Fuel Air and Actual Cycles** Assumptions for fuel–air cycles, reasons for variation of specific heats of gases, change of internal energy and enthalpy during a process with variable specific heats, isentropic expansion with variable specific heats, effect of variable specific heats on Otto, Diesel and Dual cycle, dissociation, comparison of air standard and fuel air cycles, effect of operating variables, comparison of air standard and actual cycles, effect of time loss, heat loss and exhaust loss in petrol and diesel engines,	03	10
Section II			
Module No.	Content	Hours	Weightage in %
5.	**IC Engine Performance and Emission** Measurement of indicated power, brake power, friction power, fuel consumption and emission, calculation of brake thermal efficiency, brake power and brake specific fuel consumption, variable compression ratio engines, heat balance sheet, principal engine emissions, source of engine emissions, emission measurement instruments like five gas analyzer and smoke meter, Euro and Bharat standards of emissions of I.C. Engines, Emission control methods like Air injection, Exhaust gas recirculation, Catalytic converter, Evaporative emissions control.	05	10
6.	**Fundamentals of Compressible Flow** : Ideal gas relationship, Adiabatic energy equation, Mach number and its significance, Mach waves, Mach cone and Mach angle, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility, Area velocity relationship.	12	25
7.	**Recriprocating Compressor** Construction and working, Multistage conditions for minimum work, Intercooling, Efficiency and control of air compressors. **Centrifugal Compressors** Essential parts, Static and total head properties, Velocity diagram, Degree of reaction, surging and choking, Losses in centrifugal compressor. **Axial Flow Compressor** Construction of an axial flow compressor, Aerofoil blading, Lift and drag, Performance characteristics	06	15
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Engineering Thermodynamics	P.K. Nag	McGraw Hill Education
Refrigeration and Air Conditioning	C.P. Arora	McGraw Hill India Publishing Ltd.

Internal Combustion Engine Fundamentals	John B. Heywood	McGraw Hill Education Pvt. Ltd.

Reference Book(s):

Title	Author/s	Publication
Fundamentals of Internal Combustion Engines	H.N. Gupta	PHI Learning
Turbines, Compressor and Fans	S.M. Yahya	TMH Publishers

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3521	APPLIED THEROMODYNAMICS
CO 1	Apply various laws of real gas and their mixture to make use of psychrometric properties.
CO 2	Experiment with vapor compression and vapor absorption systems.
CO 3	Explain fuel-air and actual cycles for IC engines and to develop understanding of IC engines testing and their emission norms
CO 4	Apply fundamental of compressible fluid flow.
CO 5	Demonstrate various air compressor and experiment with them.

Mapping of CO with PO

SEME3521	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1	2			3		1	2		
CO 2	2	2	1	1	1		2			2	2	
CO 3	2	2	1	2			1		1	2		
CO 4	3	3		2	1							1
CO 5	2	2	2	2	2			1	1			2

Mapping of CO with PSO

SEME3521	PSO1	PSO2	PSO3
CO 1	2	2	
CO 2		2	
CO 3	2	1	
CO 4	2	3	
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	Properties of gases and gas mixtures	1, 2, 3
2	Psychrometry	1, 2, 3, 5
3	Refrigerant and Refrigeration cycles	1, 2, 3
4	Fuel Air and actual cycles.	1, 2, 3
5	IC engine performance and emissions.	1, 2, 3, 4
6	Fundamentals of compressible flow	1, 2, 3, 4
7	Reciprocating compressors, centrifugal compressors and Axial flow compressors	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3631
Course Name: Automobile Engineering
Prerequisite Course(s): - SEME3121 – Internal Combustion Engines

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
- make students understand the basic concepts, requirements and working of various
- Components of automobile.
- enable students to design basic systems like brakes, steering, and suspensions.
- make students understand construction and working of different systems like Transmission, steering and suspensions.
- make students understand automotive electronics.
- aware students about recent technologies in automobile engineering and its working.
- reduce the pace between basic vehicle technology and technologies in modern vehicles.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction and Performance:** History and development of automobile, classification, layout, major components, Resistance to motion of vehicle, air rolling and gradient resistances. Power requirement for acceleration and gradability	04	10
2.	**Brakes:** Types of brakes – drum, disc, power and hydraulic; Brake efficiency and stopping distance, Weight transfer, skidding, antilock braking system.	05	10
3.	**Transmission System:** Constructional features and working of clutches, Gear Train: sliding mesh, constant mesh and synchromesh gear boxes with related components, Propeller and drive shaft, universal joints, Rear wheel drive arrangements, Rear axle final drive, the differential, rear axle, Simple problems in all mentioned topics, Automatic Transmission and CVT.	10	20

4.	**Wheels and Tyres:** Types of wheels, Types of tyres, Tyre thread, Tyre selection.	03	10
Section II			
Module No.	Content	Hours	Weightage in %
5.	**Electrical and Electronics System:** Electrical and electronic components of vehicle, fundamentals of engine electricals, Lighting and Indicators: Features, Requirements and typical settings, Body electrical and electronic systems, Monitoring and Instrumentation.	05	10
6.	**Steering System:** Types of suspension systems, Functional requirements of suspension systems, Front suspension system and Steering: Types, Definitions for wheel orientation and its effect, Types and Constructional features of Front Suspension, Steering layout, types of steering gears, steering linkages, steering mechanism, definitions and significance of camber, caster and king pin inclination, toe in and toe out on turn, measurement and adjustment of various steering system layouts, steering ratio, under steering and over steering, steering geometry	12	25
7.	**Suspension System:** Principle, type of suspension system, conventional and independent front and rear axle, spring, rubber and air suspensions, automatic/hydro suspension system, shock absorbers.	06	15
	TOTAL	45	100

Reference Book(s):

Title	**Author/s**	**Publication**
Automobile Engineering	Kirpal Singh	Standard Pub.& Dist.
Automobile Technology	N. K. Giri	Khanna Publication
Course in Automobile Engineering	R. P. Sharma	Dhanpat Rai & Sons.
Automobile Engineering	S. K. Saxena	Laxmi Publication Pvt. Ltd.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carried of 10 Marks of Evaluation Banner or Presentation on modern measuring Instruments.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

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

SEME3631	AUTOMOBILE ENGINEERING
CO 1	Demonstrate working of various automobile systems.
CO 2	Explore various types of tyres and wheels.
CO 3	Compare and select type of vehicle as per safety, features and applications.
CO 4	Discover the various automobile electronics.

Mapping of CO with PO

SEME3631	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1				3	3			3		3
CO 2	2	1				3	3			3		3
CO 3	2	1				3	3			3		3
CO 4	2	1				3	3			3		3

Mapping of CO with PSO

SEME3631	PSO1	PSO2	PSO3
CO 1	3	3	
CO 2	3	3	
CO 3	3	3	
CO 4	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 and Performance	1, 2, 3
2	Brakes	1, 2, 3, 5
3	Transmission System	1, 2, 3
4	Wheels and Tyres	1, 2, 3
5	Electrical and Electronics Systems	1, 2, 3, 4
6	Steering System	1, 2, 3, 4
7	Suspension	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME3650
Course Name: Quality Engineering & Reliability
Prerequisite Course(s): -- SEME2070 Mechanical Measurement & Metrology, SEME3090 – Industrial Engineering, SEME4040 – Operations Research

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
- learn various tools for TQM and design of experiments.
- Learn various tools under TPM.
- Understand the importance of ISO and QS codes.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Quality – Concept, Different Definitions and Dimensions, Inspection, Quality Control, Quality Assurance and Quality Management, Quality as Wining Strategy, Views of different Quality Gurus.	02	5
2.	**Total Quality Management (TQM)** Introduction, Definitions and Principles of Operation, Tools and Techniques, such as, Quality Circles, 5 S Practice, Total Quality Control (TQC), Total Employee Involvement (TEI), Problem Solving Process, Quality Function Deployment (QFD), Failure Mode and Effect analysis (FMEA), Fault Tree Analysis (FTA), Kizen, Poka-Yoke, 7QC Tools, PDCA Cycle, 7 New Quality Improvement Tools, TQM Implementation and Limitations.	07	15
3.	**Introduction to Design of Experiments** Introduction , Methods, Taguchi approach, Achieving robust design, Steps in experimental design.	07	15
4.	**Just-In-Time and Quality Management** Introduction to JIT production system, KANBAN system, JIT and Quality Production.	06	15
Section II			

Module No.	Content	Hours	Weightage in %
5.	**Introduction to Total Productive Maintenance (TPM)** Introduction, Content, Methods and Advantages	03	08
6.	**Introduction to ISO9000, ISO1400 and QS9000** Basic Concepts, Scope, Implementation, Benefits, Implantation Barriers.	03	08
7.	**Contemporary Trends** Concurrent Engineering, Lean Manufacturing, Agile Manufacturing, World Class Manufacturing, Cost of Quality (COQ) system, Bench Marking, Business Process Re-engineering, Six Sigma - Basic Concept, Principle, Methodology, Implementation, Scope, Advantages and Limitation of all as applicable.	06	12
8.	**Introduction to Probability Theory** Fundamental laws of probability, Random variables; Probability distribution function; Discrete and continuous distribution; Histogram and Normal distribution curve, Mean, variance and standard deviation of a distribution function. Random samples.	04	10
9.	**Reliability Concepts** Fundamental laws of probability, Random variables; Probability distribution function; Discrete and continuous distribution; Histogram and Normal distribution curve, Mean, variance and standard deviation of a distribution function. Random samples.	07	12
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Quality Assurance and Total Quality Management (ISO9000, QS9000, ISO1400)	K.C. Jain and A.K. Chitale	Khanna Publishers
Statistical Quality Control	M. Mahajan	DHanpat Rai & Co. (P) Ltd.
Quality Control & Application	B.L. Hanson & P.M. Ghare	Prentice Hall of India

Reference Book(s):

Title	Author/s	Publication
Total Quality Management	Dale H. Besterfield	Carol Besterfield-Michna, Glen H.
Reliability Engineering	L.S. Srinath	Affiliated East West Press

Web Material Links:

- https://nptel.ac.in/courses/112105233/

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Tests Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.

- End Semester Examination will consist of 60 marks.

Course Outcome(s):

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

SEME3650	QUALITY ENGINEERING & RELIABILITY
CO1	Select the tools for quality control and reliability.
CO2	Design using TQM about problem solving process, Quality Function Development and Failure Mode and effect analysis.
CO3	Explain JIT and KANBAN system for quality production.
CO4	Develop the knowledge of ISO9000, ISO1400 and QS9000

Mapping of CO with PO

SEME3650	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	1	1	3	1						2
CO 2	3	3	3	3	1							2
CO 3	3	2	1	1	1	1						1
CO 4	3	1	3	2	2	1						1

Mapping of CO with PSO

SEME3650	PSO1	PSO2	PSO3
CO 1	2		3
CO 2	3	2	1
CO 3	3	2	2
CO 4	2	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	Introduction	1,2, 3
2	Total Quality Management (TQM)	1,2, 3, 4,
3	Introduction to Design of Experiments	1, 2, 3, 4
4	Just-In-Time and Quality Management	1, 2, 3, 4
5	Introduction to Total Productive Maintenance (TPM)	1, 2, 3, 4
6	Introduction to ISO9000, ISO1400, QS9000	1, 2, 3, 4
7	Contemporary Trends	1, 2, 3, 4
8	Introduction to Probability Theory	1, 2, 3, 4
9	Reliability Concepts	1, 2, 3

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4521
Course Name: Tools Design
Prerequisite Course(s): SEME3031 – Dynamics of Machinery,
SEME3140-Design of Machine Elements,
SEME4061 – Design of Power Transmission Elements

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
- learn the basics of various tools for different operations.
- learn the design procedure for various dies for punching, blanking etc.
- impart the ability for selection of proper jigs and fixtures for different manufacturing operations.
- understand the standard data catalogue for various tools.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Tool Design** Introduction, Types of Tools, Various Manufacturing Operations, Jigs, Fixtures, Mechanics and Geometry of Chip Formation	02	5
2.	**Design of Single Point Cutting Tool** Various Angles Related to Cutting Tools, Tool Signature, Effect of Angles of Single Point Cutting Tool, Recommendation for Various Angle, Material Selection for Single Point Cutting Tool, Coated Carbide.	07	15
3.	**Design of Milling Cutter** Form Milling Cutter (Relieved), Types of Milling Cutter, Types of Milling, Forces in Milling, Nomenclature of Milling Cutter Elements, Selection of Cutter Geometry and Design	07	15
4.	**Design of Drills** Drilling operations, Nomenclature of Twist Drill Elements, Types of Drill, Recommendation Drill Point Geometry for Various Materials, Troubleshooting Drilling Problems Power Requirement for Drilling, Flat Drills	06	15
Section II			

Module No.	Content	Hours	Weightage in %
5.	**Design of Drill Jigs** Introduction, Types of Drill Jigs, Chip Formation in Drilling, General Consideration in Design of Drill Jigs, Methods of Construction, Design Problems	05	10
6.	**Design of Fixtures** Milling Fixtures, Boring Fixtures, Broaching Fixtures, Lathe Fixtures, Design Problems, Universal Fixture	05	10
7.	**Design of Sheet Metal Blanking and Piercing Dies** Introduction to Die cutting operations, Blanking and Piercing Die Construction, Pilots, Strippers and Pressure Pads, Strip Layout, Die Clearance, Design Problems	07	15
8.	**Design of Sheet Metal Bending, Forming and Drawing Dies** Introduction, Bending Dies, Forming Dies, Drawing Operations, Determination of Blank Size, Design Problems	06	15
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Tool Design	Donaldson	McGRAW-HILL Publication

Reference Book(s):

Title	Author/s	Publication
Fundamentals of tool design with CD	Nee, John	SME Publication

Web Material Links:

- https://nptel.ac.in/courses/112105233/

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Tests Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 marks.

Course Outcome(s):

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

SEME4521	TOOL DESIGN
CO1	Select the materials for various tools.
CO2	Design the single point cutting tools, piercing, blanking, forming, and bending dies.
CO3	Modify the design of jigs and fixtures for drilling, milling, broaching etc.
CO4	Apply the design procedure to design milling cutter.

Mapping of CO with PO

SEME4521	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2		1					1			2	
CO 2	2	2	2	3	3		2	1			2	1
CO 3	2		1	2	3		1	1			2	
CO 4	2	1	2	2	1		1	3			2	1

Mapping of CO with PSO

SEME4521	PSO1	PSO2	PSO3
CO 1	2	1	1
CO 2	1	1	1
CO 3	3		1
CO 4	1	2	3

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

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

Module No	Content	RBT Level
1	Introduction to tool design	1,2, 3
2	Design of single point cutting tool	1,2, 3, 4, 5, 6
3	Design of milling cutter	1, 2, 3, 4, 5, 6
4	Design of Drills	1, 2, 3, 4, 5, 6
5	Design of Drill Jigs	1, 2, 3, 4, 5, 6
6	Design of Fixtures	1, 2, 3, 4, 5, 6
7	Design of Sheet Metal Blanking and Piercing Dies	1, 2, 3, 4, 5, 6
8	Design of Sheet Metal Bending Forming and Drawing Dies	1, 2, 3, 4, 5, 6

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME4910
Course Name: Project/Summer Internship
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	
-	04	-	04	-	-	100	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Outline of the Course:

Project

- The project will be aligned with the aims of the engineering programme and its areas of specialization and shall be based on the recent trends in technology.
- The student shall carry out a comprehensive project at relevant academic / R&D / industrial organization.
- The student is required to submit a project report based on the work carried out.

Training

- The aim of this course is to use the internship experience to enable students to develop their engineering skills and practices.
- The student will be placed in industry/organization for 12 to 18 weeks and assessed for academic credit.
- The students may select industry on their own or one which is offered by institute.
- Students are expected to experience a real-life engineering workplace and understand how their engineering and professional skills can be utilized in industry.
- The student is required to submit a project report based on the work carried out.

Course Outcome(s):

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

SEME4910	**PROJECT/ SUMMER INTERNSHIP**
CO 1	Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO 2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO 3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO 4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.

CO 5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO

SEME4910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	3	3	3	3	3	1	3	3	3	3
CO 2	2	3	3	3	3	3	3	1	3	3	3	3
CO 3	2	3	3	3	3	3	3	1	3	3	3	3
CO 4	2	3	3	3	3	3	3	1	3	3	3	3
CO 5	2	3	3	3	3	3	3	1	3	3	3	3

Mapping of CO with PSO

SEME4910	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
CO 5	3	3	3

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

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

Module No	Content	RBT Level
1	Identify suitable project area/internship company	1,2, 3
2	Understand the current level of technology/operations	1,2, 3, 4, 5
3	Identify bottlenecks in technology/operations	1, 2, 3, 4, 5
4	Propose solutions	1, 2, 3, 4, 5, 6
5	Validate solutions	1, 2, 3, 4, 5, 6

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME4511
Course Name: Design of Heat Exchangers
Prerequisite Course(s): SEME3111-Heat & Mass Transfer, SEME3130 – HVAC Systems, SEME3140 – Design of Machine Elements, SEME4061 – Design of Power Transmission Elements

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
- introduce and explain basics of Heat Exchanger
- calculate basis calculation applied in heat exchanger design.
- learn about analysis and design aspects in various heat exchangers.
- elaborate enhancement and performance evolution of heat exchanger.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Classification and Selection of Heat Exchanger, Overall Heat Transfer Co-efficient, LMTD and e – NTU Analysis Methods, Fouling and its Control, Rating and Sizing Problems, Design Methodologies	08	17
2.	**Design of Double Pipe Heat Exchanger** Thermal and Hydraulic Design of Inner Tube and Annulus, Pressure Loss Calculations, Hair Pin Heat Exchanger with Bare and Finned Inner Tube	10	23
3.	**Design of Compact Heat Exchangers** Compact Heat Exchanger, Heat Transfer Enhancement, Plate Fin Heat Exchanger, Tube Fin Heat Exchanger, Heat Transfer and Pressure Drop Calculations	05	10
Section II			
Module No.	Content	Hours	Weightage In %
4.	**Enhancement and Performance Evolution** Enhancement of Heat Transfer, Performance Evaluation of Heat	08	20

	Transfer Enhancement Technique. Introduction to Inch Analysis		
5.	**Design of Shell & Tube Heat Exchanger** Construction and Basic Components, Basic Design procedure, TEMA standards, Conventional Design Methods, Bell Delaware Method, Application of Heat Exchanger	14	30
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Heat Exchanger Selection, Rating and Thermal Design	Sadik Kakac Liu H.	CRC Press, Boston, 1998
Fundamentals of Heat Exchanger Design	Ramesh K Shah	John Wiley & Sons.

Reference Book(s):

Title	Author/s	Publication
Compact Heat Exchangers	Kays V A, London A L	McGraw Hill, New York, 1964
Process Heat Transfer	Donald Q Kern	McGraw Hill

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 marks.

Course Outcome(s):

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

SEME4511	DESIGN OF HEAT EXCHANGERS
CO1	To select appropriate heat exchanger for the given application and to measure the performance degradation of heat exchangers due to fouling
CO2	Analyse thermal and hydraulic performance of double pipe and shell & tube heat exchanger.
CO3	Estimate thermal and hydraulic performance of various compact heat exchanger.
CO4	Compare various heat transfer enhancement techniques and to apply process optimization techniques for heat exchanger design.

Mapping of CO with PO

SEME4511	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1		3	3		3			3		3
CO 2	3	3	3	3	3		3	3		3		3
CO 3	3	3	3	3	3		3	3		3		3
CO 4	3	3	3	3	3		3	3		3		3

Mapping of CO with PSO

SEME4511	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	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	Design of Double Pipe Heat Exchanger	1, 2, 3, 4, 5
3	Design of Compact Heat Exchanger	1, 2, 3, 4, 5
4	Enhancement and Performance Evolution	1, 2, 5
5	Design of Shell & Tube Heat Exchanger	1, 2, 3, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4530
Course Name: AI in manufacturing
Prerequisite Course(s): -- Introduction to data science, python language, Machine Learning Fundamentals

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

- Understand the fundamentals of artificial intelligence and its applications in manufacturing.
- Learn about various AI techniques and algorithms used in manufacturing processes.
- Explore case studies and real-world applications of AI in manufacturing.
- Gain practical skills in implementing AI solutions for manufacturing problems.

Course Content

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Unit I: Introduction to Artificial Intelligence (AI)** Definitions of intelligence and artificial intelligence - Human mental capabilities: association, stereotyping, reasoning and vision - Artificial intelligence: components, scope and application areas.	8	18
2.	**Unit II: AI Languages** Programming in Prolog.	12	28
3.	**Unit III: Expert Systems** Knowledge-based or expert systems: definition, structure, characterization and justification - Knowledge sources - Expert - Knowledge acquisition and representation - Knowledge base - Interference strategies: forward and backward chaining.	8	18
Section II			
4.	**Unit IV: Expert Systems Tools and Applications** Expert system languages - Expert system shells: typical examples of shells - CLIPS programming - Expert system software for manufacturing applications in CAD, CAPP, MRP, adaptive control, robotics, process control, fault diagnosis, failure analysis, process selection, group technology, etc.	9	18

5.	**Unit V: Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms** Concepts of artificial neural networks, fuzzy logic and genetic algorithms - Manufacturing applications of neural networks, fuzzy logic and genetic algorithms - Case studies of typical applications in tool selection, process selection, part classification, inventory control, process planning, etc.	8	18
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Programming in PROLOG	Clocksin, W. F. and C. S. Mellish	Narosa Publishing House, New Delhi
Expert Systems - Principles and Programming	Giarratano, J. C. and G. D. Riley	Cengage Learning, New Delhi.

Reference Book(s):

Title	Author(s)	Publication
Artificial Intelligence and Intelligent Systems	Padhy, N. P.	Oxford University Press, New Delhi.
Neural Networks, Fuzzy Logic and Genetic Algorithms	Rajasekaran, S. and G. A.	PHI Learning Private Limited, New Delhi

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

SEME4530	Industrial Maintenance and Safety
CO1	Explain AI and its tool and implementation in machine vision.
CO2	Implement AI Languages for simple programming problems.
CO3	Explain Knowledge-based system and propose it in required applications
CO4	Implement AI in Manufacturing systems such as CAD, CAPP, MRP.
CO5	Explain Artificial Neural Networks and implement it in simple mechanical problems

Mapping of CO with PO

SEME4530	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	2	2	1	2	1	1	1		1	2
CO 2	2	1	2	2	1		1	1	1	1	1	2

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

Mapping of CO with PSO

SEME4530	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2	2	2	1
CO 3	3		2
CO 4	2	3	
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	Introduction to Artificial Intelligence (AI)	1, 2
2	AI Languages	2, 3, 4, 5
3	Expert Systems	2, 3, 4, 5
4	Expert Systems Tools and Applications	2, 3, 4, 5
5	Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms	2, 4, 5

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4540
Course Name: Industry 4.0 & IoT
Prerequisite Course(s): -- SEME4011 – Control Engineering, SECE1010 – Basics of Computer Programming

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
- learn the basics of various tools for different operations.
- learn the design procedure for various dies for punching, blanking etc.
- impart the ability for selection of proper jigs and fixtures for different manufacturing operations.
- understand the standard data catalogue for various tools.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Industry 4.0** Introduction, core idea of Industry 4.0,origin concept of industry 4.0,Industry 4.0 production system, current state of industry 4.0, Technologies, How is India preparing for Industry 4.0.	02	5
2.	**A Conceptual Framework for Industry 4.0** Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0.	07	15
3.	**Technology Roadmap for Industry 4.0** Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, Strategy Phase, New Product and Process Development Phase.	07	15
4.	**Advances in Robotics in the Era of Industry 4.0** Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly.	06	15
Section II			

Module No.	Content	Hours	Weightage in %
5.	**Understanding the Internet of Things (IoT)** Industrial Internet of Things and Cyber Manufacturing Systems, Application map for Industrial Cyber Physical Systems, Cyber Physical Electronics production.	05	10
6.	**Modeling of CPS and CMS** Modeling of Cyber Physical Engineering and manufacturing, Model based engineering of supervisory controllers for cyber physical systems, formal verification of system, components, Evaluation model for assessments of cyber physical production systems.	05	10
7.	**Architectural Design Patterns for CMS and IoT** CPS-based manufacturing and Industries 4.0., Integration of Knowledge base data base and machine vision, Interoperability in Smart Automation, Enhancing Resiliency in Production Facilities through CPS. Communication and Networking of IIoT.	07	15
8.	**Artificial Intelligence and Data Analytics for Manufacturing** Application of CPS in Machine tools, Digital production, Cyber Physical system Intelligence, Introduction to big data and machine learning and condition Monitoring.	06	15

Text Book(s):

Title	Author/s	Publication
Inside the Internet of Things (IoT)	-	Deloitte University Press
Industry 4.0: Managing the Digital Transformation	Alp Ustundag and Emre Cevikcan,	--
The Fourth Industrial Revolution	Klaus Schwab	--
The Challenges of Industry 4.0 for Small and Medium Sized Enterprises	Christian Schroder	--

Reference Book(s):

Title	Author/s	Publication
The concept Industry 4.0	Bartodziej, Christoph Jan	--
The Internet of Things: Key Applications and Protocols	-	Wiley Publications

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Tests Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 60 marks.

Course Outcome(s):

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

SEME4540	INDUSTRY 4.0 & IoT
CO1	Describe Industry 4.0 and Scope for Industry Industry

CO2	Demonstrate conceptual framework and roadmap of Industry 4.0
CO3	Describe Industrial Internet of Things and Cyber Physical Manufacturing
CO4	Describe Architectural design patterns for Industrial Internet of Things

Mapping of CO with PO

SEME4540	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1	1	1	1	1	1	1		1	1
CO 2	1	1	2	2	1	1	1	1	1	1	1	1
CO 3	1	1	1	1	1	1	1	1	1	1		1
CO 4	1	1	1	1	1	1	1	1	1	1	1	1

Mapping of CO with PSO

SEME4540	PSO1	PSO2	PSO3
CO 1	3	2	
CO 2	2	1	2
CO 3		3	3
CO 4	2	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	Introduction to Industry 4.0	1,2
2	A Conceptual Framework for Industry 4.0	1,2
3	Technology Roadmap for Industry 4.0	1, 2
4	Advances in Robotics in the Era of Industry 4.0	1, 2, 3
5	Understanding the Internet of Things (IoT)	1, 2, 3
6	Modeling of CPS and CMS	1, 2, 3, 4
7	Architectural Design Patterns for CMS and IoT	1, 2, 3, 4
8	Artificial Intelligence and Data Analytics for Manufacturing	1, 2, 3, 4

P P Savani University
School of Engineering
Department of Mechanical Engineering

Course Code: SEME4541
Course Name: Industry 4. & IoT
Prerequisite Course(s): -- SEME4 11 – Control Engineering,
SECE1 1 – Basics of Computer Programming

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
- learn the basics of various tools for different operations.
- learn the design procedure for various dies for punching, blanking etc.
- impart the ability for selection of proper jigs and fixtures for different manufacturing operations.
- understand the standard data catalogue for various tools.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Industry 4.** Introduction, core idea of Industry 4. ,origin concept of industry 4. ,Industry 4. production system, current state of industry 4. , Technologies, How is India preparing for Industry 4. .	2	5
2.	**A Conceptual Framework for Industry 4.** Introduction, Main Concepts and Components of Industry 4. , State of Art, Supportive Technologies, Proposed Framework for Industry 4. .	7	15
3.	**Technology Roadmap for Industry 4.** Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, Strategy Phase, New Product and Process Development Phase.	7	15
4.	**Advances in Robotics in the Era of Industry 4.** Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly.	6	15
5	**Obstacles and Framework Conditions for Industry 4.** Lack of A Digital Strategy alongside Resource Scarcity, Lack of standards and poor data security, Financing conditions, availability of skilled workers, comprehensive broadband infra- structure, state		

	support, legal framework, protection of corporate data, liability, handling personal data		
Section II			
Module No.	Content	Hours	Weightage in %
6.	**Understanding the Internet of Things (IoT)** Industrial Internet of Things and Cyber Manufacturing Systems, Application map for Industrial Cyber Physical Systems, Cyber Physical Electronics production.	5	1
7.	**Modeling of CPS and CMS** Modeling of Cyber Physical Engineering and manufacturing, Model based engineering of supervisory controllers for cyber physical systems, formal verification of system, components, Evaluation model for assessments of cyber physical production systems.	5	1
8.	**Architectural Design Patterns for CMS and IoT** CPS-based manufacturing and Industries 4. ., Integration of Knowledge base data base and machine vision, Interoperability in Smart Automation, Enhancing Resiliency in Production Facilities through CPS. Communication and Networking of IIoT.	7	15
9.	**Artificial Intelligence and Data Analytics for Manufacturing** Application of CPS in Machine tools, Digital production, Cyber Physical system Intelligence, Introduction to big data and machine learning and condition Monitoring.	6	15
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Inside the Internet of Things (IoT)	-	Deloitte University Press
Industry 4. : Managing the Digital Transformation	Alp Ustundag and Emre Cevikcan,	--
The Fourth Industrial Revolution	Klaus Schwab	--
The Challenges of Industry 4. for Small and Medium Sized Enterprises	Christian Schroder	--

Reference Book(s):

Title	Author/s	Publication
The concept Industry 4.	Bartodziej, Christoph Jan	--
The Internet of Things: Key Applications and Protocols	-	Wiley Publications

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Tests Each of 3 Marks and 1 Hour of duration.
- Faculty evaluation consists of 1 mark as per the guidelines provided by the course coordinator.
- End Semester Examination will consist of 6 marks.

Course Outcome(s):

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

SEME4541	INDUSTRY 4. & IoT
CO1	Describe Industry 4. and Scope for Industry
CO2	Demonstrate conceptual framework and roadmap of Industry 4.
CO3	Describe Industrial Internet of Things and Cyber Physical Manufacturing
CO4	Describe Architectural design patterns for Industrial Internet of Things

Mapping of CO with PO

SEME4541	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12
CO 1	3	2	3	2	3	1						2
CO 2	2	3	2	1	2							2
CO 3	3	2	3	3	2							2
CO 4	3	2	3	2	3							2

Mapping of CO with PSO

SEME4541	PSO1	PSO2	PSO3
CO 1	2		1
CO 2	2	1	1
CO 3	2	1	1
CO 4	1		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	Introduction to Industry 4.	1,2
2	A Conceptual Framework for Industry 4.	1,2
3	Technology Roadmap for Industry 4.	1, 2
4	Advances in Robotics in the Era of Industry 4.	1, 2, 3
5	Obstacles and Framework Conditions for Industry 4.	1, 2, 3
6	Understanding the Internet of Things (IoT)	1, 2, 3
7	Modeling of CPS and CMS	1, 2, 3, 4
8	Architectural Design Patterns for CMS and IoT	1, 2, 3, 4
9	Artificial Intelligence and Data Analytics for Manufacturing	1, 2, 3, 4