Syllabus Book

2nd Year B. Tech.
Mechanical Engineering

P P Savani University
School of Engineering
Department of Mechanical Engineering

Effective From: 2019-20
Authored by: P P Savani University

	P P SAVANI UNIVERSITY												
	SCHOOL OF ENGINEERING												
	TEACHING & EXAMINATION SCHEME FOR B.TECH. SECOND YEAR MECHANICAL ENGINEERING PROGRAMME												
Sem.	Course Code	Course Name	Teaching Scheme					Examination Scheme						Total
			Contact Hours				Credit	Theory		Practical		Tutorial		
			Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
3	SESH2011	Differential Equations	3	0	2	5	5	40	60	0	0	50	0	150
	SEME2011	Engineering Thermodynamics	3	0	1	4	4	40	60	0	0	20	30	150
	SEME2020	Material Science and Metallurgy	3	2	0	5	4	40	60	20	30	0	0	150
	SECV2102	Advanced Solid Mechanics	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2030	Non-Cutting Manufacturing Processes	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2041	Machine Drawing	0	2	0	2	1	0	0	50	0	0	0	50
	SEPD2010	Critical Thinking, Creativity & Decision Making	2	0	0	2	2	40	60	0	0	0	0	100
	SEME2910	Industrial Exposure				0	2							100
					Total	28	26							**1000**
4	SESH2022	Numerical & Statistical Analysis	3	0	2	5	5	40	60	0	0	50	0	150
	SEME2050	Forming & Machining Processes	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2060	Fluid Mechanics	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2070	Mechanical Measurement and Metrology	3	2	0	5	4	40	60	20	30	0	0	150
	SEME2081	Kinematics of Machinery	4	0	1	5	5	40	60	0	0	50	0	150
	SESH2211	Basics of Electrical & Electronics	0	2	0	2	1	00	0	50	0	0	0	50
	SEPD2020	Values & Ethics	2	0	0	2	2	40	60	0	0	0	0	100
	SEPD3030	Foreign Language		2		2	2	40	60	0	0	0	0	100
					Total	31	27							**1000**

CONTENT

Semester 3

Semester 4

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	00	02	05	40	60	00	00	50	00	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 function, Particular Integrals.	7	18
3.	**Applications of ODE and PDE** Orthogonal trajectories, Method of Separation of Variables, D'Albert's solution of wave equation, Solution of heat equation.	5	12

Section II			
Module No.	Content	Hours	Weightage in %
1.	**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
2.	**Fourier Series** Periodic function, Euler Formula, Arbitrary Period, Even and Odd function, Half-Range Expansions, Applications to ODEs.	7	15
3.	**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

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

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:
1) http://nptel.ac.in/courses/111105035/
2) http://nptel.ac.in/courses/111106100/
3) http://nptel.ac.in/courses/111105093/
4) 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 completion of the course, the student will be able to
- grasp the respective 1st and 2nd order ODE and PDE.
- analyze engineering problems (growth, decay, flow, spring and series/parallel electronic circuits) using 1st and 2nd order ODE.
- classify differential equations and solve linear and non-linear partial differential equations.
- apply understanding of concepts, formulas, and problem-solving procedures to thoroughly investigate relevant real-world problems.

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	00	01	04	40	60	00	00	20	30	150

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	05	15

	processes, third law of thermodynamics, PPM3, Entropy change for phase changing process.		
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 %
1.	**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
2.	**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
3.	**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
4.	**Refrigeration and Liquefaction** Carnot refrigeration cycle, air refrigeration cycle, absorption refrigeration, choice of refrigeration,	04	08

List of Tutorials:

Sr. No.	Name of Tutorial	Hours
1.	To interpret comparison of heat and work and solution of basic numerical on heat and work interaction.	01
2.	To solve numerical on S.F.E.E and its application to engineering devices like boiler, heat exchanger, turbine compressor etc.	02
3.	To understand concept of heat engine, heat pump, and refrigerator based on second law of thermodynamics.	02
4.	To solve basic numerical on concept of Entropy.	02
5.	To solve numerical on vapour power cylces.	02
6.	To understand reheat cycle, regenerative cycle, reheat-regenerative cycle, feedwater heaters for rankine cycle.	02
7.	To solve numerical on gas power cycles.	02
8.	To understand effect of reheat, regeneration and intercooling on brayton cycle.	02

Text Book (s):

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

Reference Book(s):

Title	Author/s	Publication
Fundamentals of Thermodynamics	Borgnakke & Sonntag	Wiley India (P) Ltd.
Thermodynamics - An Engineering Approach	Yunus Cengel & Boles	McGraw-Hill Education
Engineering Thermodynamics	Gordon Rogers and 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 completion of the course, the student will be able to
- interpret basics terms of thermodynamics.
- define and demonstrate laws of thermodynamics and its application.
- interpret differentiate concept of entropy, energy and exergy and their application.
- analyze different gas and vapour power cycles and its applications.
- identify behavior and properties of gases and its mixtures.

Department of Mechanical Engineering

Course Code: SEME2020
Course Name: Material Science & Metallurgy
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	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

Module No.	Content	Hours	Weightage in %
2.	**Phase Diagrams and Phase Transformation** Phase, Gibbs's Phase rule, Solubility and Solid Solutions, Iso-morphous alloy system, Eutectoid and Peritectic system, Evolution of Microstructure, Phase Transformation-Temperature-Time-Transformation (TTT) and Continuous Cooling Transformation (CCT) Diagrams, Electro Microscopy.	06	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.	05	13
5.	**Powder Metallurgy** Application and advantages, Production of powder, Compacting, Sintering, Equipment and process capability.	Laboratory	05
Section II			
Module No.	Content	Hours	Weightage in %
1.	**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
2.	**Non-Ferrous Alloys** Non-Ferrous Alloys of Aluminium, Magnesium, Copper, Nickel, Titanium, Microstructure and mechanical property relationships; Composite, Classification, Processing, Metal Matrix	Laboratory	05

Sr. No.		Hours	
3.	**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.	07	15
4.	**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

List of Practical:

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

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 completion of the course, the students will be able to
- interpret important mechanical properties and classification of engineering materials and metals.
- define different heat treatment process used in industrial applications.
- understand the solidification process of metals and alloys.
- analyze different microstructure, crystallography and defects of cast iron and steel specimen.
- identify different destructive & nondestructive testing methods used in the practical field and their applications.
- understand the use powder metallurgy and their application to industries.

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	00	04	40	60	20	30	00	00	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 %
1.	**Dams** Introduction, Types of dams, Rectangular dam, Stress across the section of the dam, Trapezoidal dam, stability of dam.		08	18
2.	**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 the column 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
3.	**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

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

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 Outcomes:

After completion of the course, the student will be able to
- apply mathematical knowledge to calculate the deformation behavior of simple structure.
- critically analyze problem and solve the problem related to mechanical elements and analyze the deformation behavior for different types of loads.
- understand the different types of stresses and strains developed in the member subjected to axial, bending, shear & torsional effects.
- understand the physical properties of materials.

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME2030
Course Name: Non-Cutting Manufacturing Processes
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	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 %
1.	**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%
2.	**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%
3.	**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%

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

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 completion of the course, the students will be able to
- acquire basic knowledge of various casting processes and to analyze casting defects.
- conduct various experiments on manufacturing processes and to automate them.
- understand the different types of welding processes in depth.
- demonstrate an ability to use manufacturing techniques for economic production.
- choose correct manufacturing process for a particular application.

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	
00	02	00	01	00	00	50	00	00	00	50

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.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Machining Symbols and Surface Roughness** Symbols used for machining processes, Symbols used for indication of surface roughness	--	05
2.	**Limit, Fits and Tolerances** Tolerance, Limits, Allowance, Basic Size, Design Size, Actual Size, Unilateral and Bilateral Tolerance and its representation, Fits and its types(Clearance, Transition and Interference), Introduction of Hole Basic and Shaft Basic Method	--	05
3.	**Screw Threads** Forms of screw threads, Representation of external and internal thread, Unified thread, Whitworth thread, Seller thread, British Association thread, Square thread, Acme thread, Knuckle thread, Buttress thread, Right and left hand threads	--	15
4.	**Screwed Fastening** Types of Nuts (Hexagonal, Square, Flanged, Cap, Dome, Capstan, Ring and Wing), Types of Bolt (Hexagonal, Square, Cylindrical, Cup headed, Countersunk headed, Hook, Headless tapered, Eye bolt, Lifting bolt, Stud bolt)	--	15

5.	**Keys, Cotter and Pin Joint** Key and keyways, Types of Keys (Taper Key, Saddle Key, Round or Pin Key, Gib Head Key, Feather or Parallel Key, Woodruff Key), Cotter and Cotter Joint, Pin Joint or Knuckle Joint	--	10

Section II			
Module	Content	Hours	Weightage in %
1.	**Riveted Joints, Bolted Joints, Welding Joints and Welding Symbols** Riveted Joint, Forms of riveted head (Cup, Pan, Conical, Countersunk, Rounded Countersunk and Ellipsoid), Riveted Lap and Butt Joints, Welding Joints and Symbols (Lap, Butt, Tee, Corner or Edge)	--	15
2.	**Drafting Software** Introduction of Software, Part Drafting Exercise (2D as well as 3D)	--	35

List of Practical:

Sr No	Name of Practical	Hours
1.	Sheet of Machining Symbols and Surface Textures	02
2.	Sheet of Types of Screw Threads	02
3.	Drafting Exercise of Types of Nuts and Bolts	04
4.	Sheet of Types of Keys, Cotter and Knuckle Joint	04
5.	Sheet of Types of Riveted Joints, Welding Joints and Welding Symbols	02
6.	Sheet of Plummer Block or Pedestal Bearing	02
7.	Drafting Exercise of Part in Drafting software	14

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 completion of the course, the students will be able to

- interpret Industrial Drawings.
- interpret Machining and Welding Symbols.
- interpret Part and Assembly Drawings.
- select Screw Threads, Screw Fasteners, Welding and Riveted Joints.

P P Savani University
School of Engineering

Centre for Skill Enhancement & Professional Development

Course Code: SEPD2010
Course Name: Critical Thinking, Creativity and Decision Making
Prerequisite Course(s): --

Teaching & Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to
- develop a familiarity with the mechanics of critical thinking and logic.
- understand basic concepts of critical and creative thinking.
- explore and understand critical thinking for the purpose of creativity in context of professional, social and personal spectrum.
- explore an application critical thinking and creativity in personal, social, academic, global and profession life.
- understand Decision making as a skill to be learned through critical thinking.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Critical Thinking** • Concept and meaning of Critical Thinking • Significance of Critical Thinking in personal, social and professional life • Thinking with arguments, evidences and language	08	25
2.	**Applied Critical Thinking** • Inductive and Deductive Thinking • Questioning for Generating Ideas • Socratic Questioning and its application	07	25
Section II			
Module	Content	Hours	Weightage in %
1.	**Conceptual Thinking** • Second order thinking • Synthesizing	03	10

20

2.	**Creative Thinking and Decision Making** • Problem Solving • Adapting Various Structures of Decision Making	06	20
3.	**Moral Thinking** • Generating and structuring ideas • Designing and Evaluating the solutions • Case Study	06	20

Text Book (s):

Title	Author/s	Publication
Thinking Skills for Professionals	B. Greetham, Palgrave	Macmillan, 2010

Reference Book(s):

Title	Author/s	Publication
An Introduction to Critical Thinking and Creativity: Think More, Think Better	J. Y. F. Lau	John Wiley & Sons., New hercy
Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving	Jennifer Wilson	CreateSpace Independent Publishing Platform, 2017
Creativity and Critical Thinking	edited by Steve Padget	Routledge 2013

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

Course Outcome(s):
After completion of the course, the student will be able to
• comprehend the concept and application of critical thinking as well as its applications.
• understand the critical thinking in context of creativity, logical arguments, moral reasoning.
• understand the application of critical thinking for social, academic, global and professional spectrum.
• correlate their thinking skills for better productivity and outcome-based tasks.
• be in a better position to apply 360° analysis of the situation for decision making.

Department of Mechanical Engineering

Course Code: SEME2910
Course Name: Industrial Exposure
Prerequisite Course(s): --

Teaching & Examination Scheme:

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

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	00	02	05	40	60	00	00	50	00	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 complex function, 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	6	13
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, Trapezoidal Rule, Simpson's 1/3-rule, Simpson's 3/8-rule, Euler-Maclaurin Formulae	7	17

24

Module	Content	Hours	Weightage in %
	Section II		
1.	**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.	7	15
2.	**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.	8	18
3.	**Testing of Hypothesis** Introduction, Sampling, Tests of significance for parametric test, Null Hypothesis, Type 1 and Type 2 errors, Level of significance, Chi-square test, Student's t-test, Seducer's f-test	7	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

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:
1) http://nptel.ac.in/courses/111106094/
2) http://nptel.ac.in/courses/111106084/
3) http://nptel.ac.in/courses/111105035/
4) http://nptel.ac.in/courses/111101003/
5) 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 completion of the course, the student will be able to
- derive numerical solution of linear and non-linear system of equation.
- acquire knowledge of finite differences, interpolation, numerical differentiation and numerical integration.
- select appropriate method to collect data and construct, compare, interpret and evaluate data by different statistical methods.
- apply concept of probability in decision making, artificial intelligence, machine learning etc.

Department of Mechanical Engineering

Course Code: SEME2050
Course Name: Forming and Machining Processes
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	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 of Metal Working, Various Temperatures in Metal Working, Cold and Hot Working, Formability, Strain Rate Effects on metal forming, Effects of Metallurgical Structure on Metal Forming, Hydro 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, Production of Seamless Pipe and Tubing. Drawing of Rods, Wires and Tubes, Sizing.	05	12

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 %
1.	**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
2.	**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
3.	**Planers, Shapers and Slotters** Classification, Attachments extending the processing capacities of each.	03	06
4.	**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
5.	**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, Manufacture of grinding wheels.	04	08

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 completion of the course, the student will be able to
- understand metal forming processes like forging, drawing, rolling, extrusion, and deep drawing.
- understand the basic concept of machining operations of different machines.
- analyze any conventional machining processes.
- identify and suggest correct manufacturing process for particular application.
- generate the sequence of machining operation to produce the end product.
- judge the limitations and scope of machines to perform variety of operations.
- understand metal forming processes like forging, drawing, rolling, extrusion, and deep drawing.

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME2060
Course Name: Fluid Mechanics
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	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 Dimensional Flow, Uniform and Non Uniform Flow, Rotational and Irrotational Flow, Stream Lines and Stream Function, Velocity Potential Function, Relation between stream and velocity	07	15

Module No.	Content	Hours	Weightage in %
	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 %
1.	**Dimensional Analysis** Dimensions, Dimensional Homogeneity, Raleigh and Buckingham π Theorem, Non-Dimensional Numbers, Similarities – Geometrical, Kinematics and Dynamic.	05	10
2.	**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
3.	**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
4.	**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

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

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 completion of the course, the student will be able to
- understand fundamentals of fluids.
- analyze various flow problems and flow characteristics.
- determine major and minor losses through different pipes.
- apply the concept of fluid mechanics to design various system.

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME2070
Course Name: Mechanical Measurement and Metrology
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	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, Comparison Methods and Direct Instrument Measurement, Sample Length, Numerical Evaluation of Surface	04	09

	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 %
1.	**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
2.	**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
3.	**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
4.	**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
5.	**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,	04	09

| | 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 | | |

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)	-

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 completion of the course, the student will be able to
- describe basic concepts of Metrology.
- select linear measuring instrument for measurement of various components.
- select angular and taper measurement devices for measurement of various components.
- distinguish between various screws by measuring their dimensions.
- understand different gears through measurement of various dimensions of gears.
- measure surface finish of the component produced.
- describe basic concepts of mechanical measurement and errors in measurements.
- select appropriate temperature measuring device for various applications.
- describe methods of measurement for various quantities like force, torque, power, displacement, velocity and acceleration.
- use Coordinate Measuring Machines (CMM) in industry.

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	00	01	05	40	60	00	00	50	00	150

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 of slider 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, Velocity diagrams.	12	20

3.	**Acceleration Analysis** Definition of acceleration, Angular acceleration, A general case of acceleration, Radial and transverse components of acceleration, The coriolis component of acceleration, Examples of acceleration analysis, Acceleration diagrams.	12	20
	Section II		
Module No.	Content	Hours	Weightage in %
1.	**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
2.	**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
3.	**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

List of Tutorials:

Sr No	Name of Tutorial	Hours
1.	Velocity diagram using Instantaneous center method	03
2.	Velocity and acceleration analysis of simple mechanism	02
3.	Velocity and acceleration analysis of mechanism involving coriolis component	02
4.	Layout of cam profile for reciprocating knife edge follower	02
5.	Layout of cam profile for offset reciprocating roller follower	02
6.	Layout of cam profile for flat faced reciprocating follower	02
7.	Layout of cam profile for oscillating follower	02

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 completion of the course, the student will be able to
- demonstrate an understanding of the concepts of various mechanisms and pairs.
- do velocity and acceleration analysis of different mechanism.
- design a layout of cam and follower for specific motion.
- demonstrate an understanding of principle of gears.

Department of Applied Sciences & Humanities

Course Code: SESH2211
Course Name: Basics of Electrical & Electronics
Prerequisite Course(s): SESH1210-Physics

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	02	00	01	00	00	50	00	00	00	50

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- understand basic fundamental electronic circuit.
- learn to use common electronic instrumentation.
- explain the construction and application of standard circuit configurations and identify the component types and connections used to build functioning electronic circuits.
- understand components of instruments, terminology and applications.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Electrical Instrument** Multimeter-Application, Sensitivity, Merits And Demerits. Cathode Ray Oscilloscope-Working, Application, Understanding Different Type Of Waveforms Formed On Cro. Understanding The Bread Board Connection. Electrical Component, Lamped Circuit Element-Classification Of Resistors, Carbon Color Coded Resistance, Capacitor, Inductor Kirchhoff's Laws	--	15
2.	**Three phase AC circuit** Advantage, generation, phase sequence, balance load, relationship between line and phase value, power measurement in balanced three phase circuit.	--	20
3.	**Electrical safety** Electrical wiring, Different type of wiring system, Safety precaution in handling electrical appliances, Cause of electric shock, Types of earthing, Circuit protection device, Earthing, Difference between Fuse and MCB.	--	15

Section II			
Module No.	Content	Hours	Weightage in %
1.	**Logic Gates & Family** Classification of logic gates and ICs (74XX), symbols and truth table verification of basic logic gates, multiple input basic logic gates, Universal gates, Implementation of different Boolean functions using various gates.	--	25
2.	**PCB Designing** Drawing and printing layout on board, photo etching process, masking process, PCB manufacturing techniques, Software	--	25

List of Practical/Exercise(s):

Sr. No	List of Practical/Exercises	Hours
1.	Identify various tools used for wiring	02
2.	Identify the symbols used in electrical circuit diagrams	02
3.	Verification of truth tables of all logic gates	02
4.	Verification of De Morgan's theorem, the postulates of Boolean algebra and Realization of Sum of Product and Product of Sum expression using universal gates	04
5.	Implementation of the given Boolean function using logic gates	02
6.	Understanding Electricity lab	02
7.	Understanding the breadboard connection.	02
8.	Understanding seven segment led using bread board	02
9.	Understanding Network Theorem	02
10.	Study full wave & Half wave rectifier	02
11.	To Study and calculate Ripple factor and efficiency of various Rectifier	03
12.	PCB design of a small circuit with its layout using tapes & etching in the lab	05

Text Book(s):

Title	Author/s	Publication
Making Printed Circuit Boards	Jan Axelsen	Mc GrawHill
Fundamentals of Digital Circuits	A.Anand Kumar	Prentice-hall of India Pvt. Ltd
Electronics Instrumentation	H S Kalsi	TMH

Reference Book(s):

Title	Author/s	Publication
Digital Electronics and Circuit design	Malvino & Leach	TMN
Everyday Electronics Data Book	Mike Tooley	B P B
Electrical Technology	B.L.Theraja	S.Chand

Web Material Links:
- https://nptel.ac.in/courses/108108076/
- http://www.nptelvideos.in/2012/11/basic-electronics-prof-tsnatarajan.html
- http://vlab.co.in/

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 completion of the course, the student will be able to
- use the techniques, skills and modern engineering tools necessary for engineering practice
- identify and understand importance of various electrical and electronics components.
- acquire knowledge about analog and digital communication.
- develop the idea of identifying, analyzing and designing combinational circuits.

P P Savani University
School of Engineering

Centre for Skill Enhancement & Professional Development

Course Code: SEPD2020
Course Name: Values & Ethics
Prerequisite Course(s): --

Teaching & Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learners to

- develop a familiarity with the mechanics of values and ethics.
- understand basic concepts of values and ethics
- explore and understand values, ethics in context of professional, social and persona spectrum
- explore an understand values, ethics in context of globalization and global issues
- explore an application of values and ethics in personal, social, academic, global and professional life.
- understand harmony at all the levels of human living and live accordingly.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Values** • Definition and Concept • Types of Values • Values and its Application	03	10
2.	**Elements and Principles of Values** • Universal & Personal Values • Social, Civic & Democratic Values • Adaptation Models & Methods of Values	06	20
3.	**Values and Contemporary Society** • Levels of Value Crisis • Value Crisis Management • Values in Indian Scriptures	06	20
Section II			
Module No.	Content	Hours	Weightage in %
1.	**Ethics and Ethical Values** • Definition and Concept	07	25

	• Acceptance and Application of Ethics • Ethical Issues and Dilemma • Universal Code of Ethics: Consequences of Violation		
2.	**Applied Ethics** • Professional Ethics • Organizational Ethics • Ethical Leadership • Ethics in Indian Scriptures	08	25

Text Book (s)

Title	Author/s	Publication
Values and Ethics in Business and Profession	By Samita Manna, Suparna Chakraborti	PHI Learning Pvt. Ltd., New Delhi, 2010

Reference Book(s):

Title	Author/s	Publication
Just a Job?: Communication, Ethics, and Professional life	George Cheney	Oxford University Press, 2010
Professional Ethics and Human Values	M. Govindarajan, S. Natarajan, V. S. Senthilkumar	PHI Learning Pvt. Ltd, 2013
Creating Values In Life: Personal, Moral, Spiritual, Family and Social Values	By Ashok Gulla	Author House, Bloomington, 2010
E-Book(s)		
• Ethics for Everyone, Arthur Dorbin, 2009. (http://arthurdobrin.files.wordpress.com/2008/08/ethics-for-everyone.pdf) • Values and Ethics for 21st Century, BBVA. (https://www.bbvaopenmind.com/wp-content/uploads/2013/10/Values-and-Ethics-for-the-21st-Century_BBVA.pdf)		

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

Course Outcome(s):
After completion of the course, the student will be able to
• understand and relate the concepts and mechanics of values and ethics in their life.
• correlate the significance of value and ethical inputs in and get motivated to apply them in their life and profession.
• realize the significance of value and ethical inputs in and get motivated to apply them in social, global and civic issues.
• learn to apply such principles with reference to Indian scriptures

P P Savani University
School of Engineering

Center for Skill Enhancement and Professional Development

Course Code: SEPD3030
Course Name: German Language
Prerequisite Course(s): Foreign Language

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	00	00	02	40	60	00	00	00	00	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learner to

- develop and integrate the use of the four language skills i.e. listening, speaking, reading and writing.
- use the language effectively and appropriately on topics of everyday life situations.
- develop an interest in the appreciation of German.
- develop an intercultural awareness.
- enhance the ability of the candidates to express their ideas and feelings in their own words and for them to understand the use of correct language.
- appreciate the language as an effective means of communication.
- understand language when spoken at normal conversational speed in everyday life situations.
- understand the basic structural patterns of the language, vocabulary and constructions.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to German** • Alphabets • German accents • German Numbers • What are the similarities and differences between English and German? • Greetings	2	15
2.	**German Time** • Basic Introduction	2	08
3.	**Vocabulary part-1** • The days of the week • The months of the year	2	05

	Seasons • Directions • Weather		
4.	**Vocabulary part-2** • Family • Colors and Shapes • Day/time indicators • Body parts • Clothing	2	07
5.	**Vocabulary Part-3** • Food and Meals • Fruits, Vegetables and Meats • Sports and Hobbies	2	05
6.	• Transportation • House and Furniture	2	05
7.	• School Subject • Places • Common Expressions	2	05

Section II			
Module No.	Content	Hours	Weightage in %
1.	**German grammar** • Verb Sein (to be) • Verb Haben (to have) • Introduction of Regular verbs and Irregular verb • Konjugation of Regular verb • First group verbs('EN' group)	2	10
2.	• Konjugation of Regular verbs • Second group verbs('Ten/Den' group) • Konjugation of Irregular verbs • Third group verbs (Stem change verb) • Fourth group verbs (Spell Change Verb)	2	10
3.	• Nicht trennbare und trennbare Verben • Die Modalverben • Personalpronomen-Nominativ	2	10
4.	• W-Frage • Ja/Nein-Fragen • Nomen und Artikel-Nominativ • Die Anrede	2	10
5.	• Nomen-Genusregein • Adjektiv • Nomen und Artikel-Akkusativ • Personalpronomen-Akkusativ	2	10
6.	• Practice of Writing • Practice of Speaking	2	-
7.	• Practice of Listening	2	-
8.	• Practice of Reading	2	-

Text Book(s):

Title	Author/s	Publication
Namaste German	Yoshita Dalal	Yoshita Dalal

Reference Book(s):

Title	Author/s	Publication
Fit In Deutsch	**Hueber**	**Goyal Publication**

Web Material Links:
- https://www.youtube.com/watch?v=iGovllrEsF8&list=PLRps6yTcWQbpoqIOCmqMeI1HLnLIRmO_t
- https://www.youtube.com/watch?v=GwBfUzPCiaw&list=PL5QyCnFPRx0GxaFjdAVkx7K9TfEklY4sg

Course Evaluation:

Theory:
- Continuous Evaluation consists of a Test of 30 marks and 1 hour of duration.
- German Speaking Exam consists of 10 marks.
- End Semester Examination will consist of 60 marks Exam.

Course Outcome(s):

After completion of the course, the student will be able to
- demonstrate speaking, reading, writing and listening in German.
- understand German Technology.
- communicate easily in four Language and they can get good job in German Company.
- demonstrate the level of proficiency necessary to enable them to function in an environment where German is used exclusively.