SGGS INSTITUTE OF ENGINEERING AND TECHNOLOGY NANDED

Department of Mechanical Engineering

S.Y. B. Tech. (Mechanical) Curriculum Structure

Academic year 2019-20 onwards

Semester III (Second Year)

Programme Educational Objectives (PEOs)

PEO 1 Provide knowledge and skills of broad spectrum in domain of Mechanical Engineering.

PEO 2 Cater the needs of Indian as well as multinational industries and other organisations.

PEO 3 Be competent with a strong technological background, to formulate, analyse the societal, industrial and environmental challenges to obtain the economically viable solutions.

PEO 4 Foundation for higher studies, research, entrepreneurship and administrative services.

PEO 5 Inculcate the attitude of self and lifelong learning, out of box thinking, ethics and integrity, professional and managerial competencies to work on the multidisciplinary projects.

Programme Outcomes (POs):

Engineering Graduates will be able to:

a. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **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.

k. **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 and in multidisciplinary environments.

l. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs):

B.Tech Mechanical Engineering

PSO 1 Apply Principal of engineering, basic sciences and mathematics to model, analyse, design mechanical systems and processes.

PSO 2 Plan, operate, control, maintain & improve mechanical systems, components & processes.

Correlation Matrix (Correlation between the PEOs and the POs)

PO/PSO ➡ PEO ⬇	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO 2
PEO 1	√				√					√		√	√	√
PEO 2	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO 3	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO 5	√						√	√		√	√	√	√	√

Note: The cells filled in with ✓ indicate the fulfillment/correlation of the concerned PEO with the PO.

Structure of curriculum

Semester I						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits**	
					Th	**Pr**
BSC271	Mathematics-III: Transform Calculus and Differential Equations	3	--	--	3	--
PCC-ME201	Strength of Materials	3	--	2	3	1
PCC-ME202	Thermodynamics	3	--	2	3	1
PCC-ME203	Mechanical Instrumentation	3	--	2	3	1
PCC-ME204	Manufacturing Processes-I	3	--	2	3	1
PCC-ME205	Materials Engineering	3	--	2	3	1
HMC278	Human Values and Professional Ethics	2	--	--	2	--
BSC261	Mathematical Foundation for Engineering*	2	--	--	Audit	
	Total	**22**	**--**	**10**	**25**	
Semester II						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits**	
					Th	**Pr**
BSC274	Mathematics-IV: Statistical and Numerical Methods	3	--	--	3	--
PCC-ME206	Applied Thermodynamics	3	--	2	3	1
PCC-ME207	Fluid Mechanics and Hydraulic Machines	3	--	2	3	1
PCC-ME208	Machine Drawing and CADD	3	--	2	3	1
PCC-ME209	Manufacturing Processes-II	3	--	2	3	1
PCC-ME210	Kinematics and Theory of Machines	3	--	2	3	1
MAC277	Indian Constitution	2	--	--	Audit	
	Total	**20**	**--**	**10**	**23**	

L – No. of Lecture Hours/week, T – No. of Tutorial Hours/week, P – No. of Practical Hours/week

* This Audit course is only for Direct Second Year students and a MANDATORY course.

BSC271–MATHEMATICS-III: Transform Calculus and differential Equations

(CREDITS THEORY: 03, PRACTICAL: 0)

Course code: BSC271	(L- 03, T- 0, P- 0, C-03)

Course Objectives:

1. To understand the concepts of Laplace transforms, Fourier Series, Fourier transforms
2. To apply Laplace transforms for solving ordinary differential equations.
3. Define and compute the line integral, surface integral, volume integral using Green's Theorem, Stokes's Theorem and the Divergence Theorem.
4. To understand the methods of solving partial differential equations such as wave equation, heat equation and Laplace equation.

Course Outcomes:

On successful completion of this course students will be able to;

CO1. Develop the skills of Laplace Transforms, Fourier series and Fourier Transforms and their inverses.

CO2. Develop the skills of solving Partial differential equations

CO3. Solve ODE's and PDE's using the properties of Laplace transform, Fourier series and Fourier Transforms.

CO4. Determine solutions of PDE for vibrating string and heat conduction.

CO5. Evaluate line integrals, surface integrals, and volume integrals and convert line integrals into area integrals and surface integrals into volume integrals using integral theorems.

Articulation Matrix:

PO ➡ / ⬇CO	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
CO 1	3	3										2		
CO 2	3	3	1	2								2		
CO 3	3	3	1	2								2		
CO 4	3	3	1	2								2		
CO 5	3	3	2	2								2		

Note: 1-Low, 2-Medium or 3- High.

Evaluation Scheme:

Continuous Evaluation	**Theory**
Before Mid Term: 10 Marks	Mid Term: 30 Marks
After Mid Term: 10 Marks	End Term: 50Marks
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1: Laplace Transforms (10 hours)

Laplace transforms, inverse Laplace transforms, Properties of Laplace transforms, Laplace transforms of unit step function, impulse function, Convolution theorem; Applications of Laplace transforms - solving certain initial value problems.

Unit 2: Fourier Series (07 hours)

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions.

Unit 3: Fourier Transforms (10 hours)

Fourier Integrals, Fourier transforms-sine, cosine transforms and inverse transforms - simple illustrations

Unit 4: Vector Calculus (10 hours)

Line integrals, surface integrals, Integral Theorems: Greens theorem, the divergence theorem of Gauss and Stokes theorem

Unit 5: Partial Differential Equations (08 hours)

Method of Separation of variables for solving partial differential equations, first and second order one dimensional wave equation, heat equation and two dimensional Laplace equation.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Fifth Edition, Narosa Publishing House, 2016.
3. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, Inc. Mineola New York.

PCC-ME201 – Strength of Materials

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC-ME201	(L- 03, T- 0, P- 2, C-03)

Course Objectives:

1. To provide the basic concepts and principles of strength of materials.
2. To make aware of stress, strain and deformations induces in various structural members.
3. To impart the techniques to determine stress and strain in structural members.
4. To impart the basics required for designing the machine/ structural components

Course Outcomes: At the end of course, student will be able to;

CO1. Define the various law's, concepts and principals used in mechanics of materials.
CO2. Predict the deformation, and failure of deformable bodies under external loading.
CO3. Shows ability to determine stress and strain at any point in a member.
CO4. Shows ability to analyse various type of stress, strains and deformations in beams, shafts, cylinders etc.
CO5. Evaluate the deflections in beams and columns.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3		2	1			2						3	2
CO2		3	3	3	2		2						3	2
CO3	3	3	3	3	2								3	2
CO4	3	3	3	3	2		2						3	2
CO5	3	3	3	3	2		2						3	2

Evaluation Scheme:

Theory	**Practical**
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Simple Stress and Strain: Concept of stress and strain (linear, lateral, shear & volumetric), Hookes Law, Elastic constants & their relationship, Stresses of varying section in step, circular and rectangular. Temperature stresses. [06 hrs]

Principal Stresses and Strains: Normal & shear stress on any oblique plane & concept of principal plane, principal planes by analytical methods & graphical method. [05 hrs]

Strain Energy: Strain energy due to axial loads, impact loads. [02]

Unit 2

Bending Stresses: Theory of simple bending, Concept and assumptions, Derivation of flexure formula, bending stresses distribution diagram, ddifferent IS steel section, flitched beams, Design of a section.(05 hrs)

Shear Stress in Beams: Concept and derivation of shear stress distribution formula, Shear stress distribution diagram for symmetrical and unsymmetrical section. [04 hrs]

Combined direct and bending stresses: Introduction, stress distribution for an eccentric loaded rectangular section, the middle third rule, core or kernel section, circular solid and hollow section, structural sections. [04 hrs]

Unit 3

Torsion of Circular Shaft: Theory of torsion of shaft of circular cross section, Assumptions, Derivation of torsion formulae, Stress in shaft of hollow, solid, composite circular cross section subjected to twisting moments, Stresses due to combined torsion, bending and axial force on shaft, flanged coupling. [06 hrs]

Unit 4

Thin & Thick Pressure Vessels: Thin pressure vessels: Stress, Strain and deformation in thin walled seamless cylindrical and spherical vessels. Thick pressure vessels: Lame's theory, Stresses in thick cylindrical shell and compound cylinder, Initial difference of radii at the junction of compound tube, Stresses in thick spherical shell. [06 hrs]

Unit 5

Deflection of Beams: Concept of deflection, Slope and deflection by double integration method (Macauley's method). Slope and deflection for simply supported, cantilever and statically determinate beam. [06 hrs]

Unit 6

Axially Loaded Columns :- Concept of critical load and buckling, Derivation of Euler's formula for buckling load with various end conditions, limitations of Euler's formula, Rankine buckling load, Safe load on column. [06 hrs]

Term Work:

It shall consist of various assignments and practical based on above syllabus.

List of Experiments:

The term work shall consist of following lab test on mechanical properties of material

1. Tension test on M.S. and TOR bar (ductile and brittle material).
2. Bending test.
3. Shear test.
4. Torsion test.
5. Impact test.
6. Deflection of beam

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. R. K. Rajput " Strength of Materials" S.Chand & Company (Ltd) New Delhi

Reference Books:

1. Beer and Johnston "Mechanics of Materials" 7th Ed., McGraw Hill Education., 2017
2. Timoshenko and Young, "Strength of Material", East West Press, 2011.
3. S. Ramamurthum, "Strength of Materials", Dhanapatrai & Publication, New Delhi
4. I. B. Prasad, "Engineering Mechanics and Strength of Materials", Khanna Publishers, 1992.

PCC-ME202 – Thermodynamics

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC-ME202	(L- 03, T- 0, P- 2, C-03)

Course Objectives:

1. To impart the principles of work and energy.
2. To inculcate fundamentals of thermodynamics laws, concepts & principles.
3. To make familiar with various thermodynamic cycles and to apply thermodynamic concepts in various applications like I.C. Engine & Air Conditioning.
4. To comprehend knowledge about properties of pure substance.

Course Outcomes: At the end of course, student will be able to;

CO1. Define the fundamentals of the first and second laws of thermodynamics and explain their application to a wide range of systems.

CO2. Analyze the work and heat interactions associated with a prescribed process path and to perform analysis of a flow system.

CO3. Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.

CO4. Evaluate properties of pure substances and gas mixtures.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3	2										1	3	2
CO2	2	2	1	2		1	1					2	3	
CO3	2	2		2									1	1
CO4	3	2											2	
CO5														

Evaluation Scheme:

Theory	**Practical**
Mid Term: 30 Marks	Continuous Evaluation: 50%
End Term: 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Fundamental Concepts and Definitions: Thermodynamic systems, properties, processes and cycles. Thermodynamic equilibrium, Quasi- static process, Macroscopic vs. Microscopic viewpoint, Work and heat Transfer: Work transfer, p.dv and other types of work, Heat transfer, temperature and its measurement (principle of measurement, various instruments etc.) Zeroth law of thermodynamics, specific heat and latent heat, point function, path function. [08 hrs]

Unit 2

First Law of Thermodynamics: First law of thermodynamics for a closed system undergoing a cycle

and change of state, Energy, different forms of energy, Enthalpy, PMM-I, control volume, application of first law of steady flow processes (nozzle, turbine, compressor pump, boiler, throttle valve etc.) [08 hrs]

Unit 3

Second Law of Thermodynamics: Limitation of first law of thermodynamics, cycle heat engine, refrigetor and heat pump, Kelvin- Plank and Clausius statements and their equivalence, Reversibility and Irreversibility, Carnot theorem. [08 hrs]

Unit 4

Entropy: Introduction, Clausius theorem, T-s plot, Clausis inequality, Entropy and Irreversibility, Entropy principle and its application, combined I and II law, Entropy and direction, Entropy and disorder, Availability: Available energy pertaining a cycle. [08 hrs]

Unit 5

Ideal gas: Avogadro's law, Equation of state, ideal gas and process, relation between C_p and C_v. [06 hrs]

Unit 6

Properties of Pure Substance: Phase change of pure substance, phase diagram of pure substance, p-v, T-s, and h-s diagrams properties of steam, property table, representation of processes of steam on p-v, T-s, and diagrams, Dryness fraction and its measurement. [06 hrs]

Term work:

Part A: Following Four experiments to be conducted

1. An experimental evaluation of Specific Heat of Air.
2. Measurement of dryness fraction by Separating and Throttling calorimeter
3. Study and Demonstration of Non-contact type thermometer
4. Demonstration of temperature measurement by thermocouple in conformity to Zeroth law of thermodynamics

Part B: At least five assignments based on the above topics

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. Y.A. Cengel and M.A. Boles, Thermodynamics – An Engineering Approach, McGraw Hill, 5th edition, 2006.

Reference Books:

1. P.K. Nag, Engineering Thermodynamics, Tata Mc-Graw Hill, 3rd edition, 2005 New Delhi.

2. G.J. Van Wylen and R.E. Sonntag, Fundamental of Thermodynamics, John Wiley & Sons, 5th edition, 1998.

PCC-ME203 – Mechanical Instrumentation

(CREDITS THEORY:03, PRACTICAL: 01)

Course code: PCC-ME203	(L- 03, T- 0, P- 2, C-03)

Course Objectives:

1. To impart the basic principles, construction and working of mechanical measurement science.
2. To inculcate proficiency in using, calibrating various measurement systems.
3. To comprehend problems in measurement system and develop the competency to resolve the problems.
4. To make aware all the measuring instruments and to measure different parameters in day-today work.

Course Outcomes: At the end of course, student will be able to;

CO1. Use proper measuring instruments for various applications with engineering philosophies.

CO2. Select and use the proper instruments to measure the flow of fluids, strains, pressure, speed, and temperature.

CO3. Determine the errors in measuring instrument and calibrate them accordingly.

CO4. Calculate limit fits and tolerances needed for the engineering components.

CO5. Measure the linear dimensions, surface finish, angular dimensions and gear terminologies with proper equipment.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3		2		2	1			1	1	2	2	2	2
CO2	3	2	2	3		2	1						2	2
CO3	2	2										1	2	1
CO4	1	3	3	1	1						2		3	1
CO5	2	1	1	2	2							1	2	1

Evaluation Scheme:

Theory	**Practical**
Mid Term: 30 Marks	Continuous Evaluation: 50%
End Term: 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Mechanical Measurement:

Unit 1

Need of mechanical measurement, Instruments, Measurement methods, Generalized measurement system, Static performance characteristics, Errors and their classification. [03 hrs]

Transducers: Classification and various types of transducers [02 hrs]

Measurement of strain: Introduction, classification of strain gauges, Gauge factor, Temperature compensation, Quarter, Half and Full Bridge circuit, Application to measurement of load/force, Torque. [04 hrs]

Unit 2

Measurement of Pressure: importance of pressure and vacuum measurement, Range of high pressure and vacuum, Bourdon tubes, Dead weight pressure gauge testers, Diaphragm gauge, LVDT, Piezoelectric pressure gauge, MCLeod gauge, Thermal conductivity gauge. [04 hrs]

Measurement of flow: Importance of flow measurement, Water meter, Turbine meter, Rota meter, Air/Gas flow meter, Hot wire anemometer, Electromagnetic flow meter, Venturimeter, Pitot tube. [03 hrs]

Unit 3

Temperature Measurement: Importance of Temperature Measurement, Thermometers, Themisters, Thermocouples and its laws, Pyrometers. [03 hrs]

Speed Measurement: Importance of Angular Speed Measurement, Tachometer-Mechanical and Eddy current type, Mechanical counter, Stroboscope, Non-contact type counters-Inductive pickup, capacitive pickup and photoelectric pickup. [03 hrs]

Unit 4

***Introduction to Metrology**:*

Definition, Linear measurement – Standards, Classification of standards, Vanier calliper, Height gauge, Depth gauge, Feeler gauge, Slip gauge, Micrometre [02 hrs].

Limits, Fits and Gauges: Terminology, Definitions, Hole basis and Shaft basis system, Limit, Fits, Tolerances, Taylor's principle of gauge design, Principles of gauge design (Simple numerical problems on limits of size, tolerances etc.), Types of gauges, Interchangeability, Selective assembly. [03 hrs]

Unit 5

Comparators: Types and working principles of mechanical, pneumatic, electronic, optical, electrical comparators and their applications. [03 hrs]

Interferometry: Principles of interferometry, Sources of light, Optical flat, Fringe patterns, Toolmakers microscope, Profile projector. [03 hrs]

Unit6

Surface Finish Measurement: Definitions, Surface texture terminology, Measurement of surface roughness, Symbols and values of surface roughness. [03 hrs]

Angular Measurement: Bevel protractor, Sine bar, Sine center and table, Angle gauge, Clinometer, Autocollimator, Angle dekkor. [03 hrs]

Metrology of Screw Threads / Gear Metrology: Screw thread terminology, Screw thread micrometer, Floating carriage micrometer. Gear terminology, Measurement of tooth thickness by gear tooth vernier caliper. [03 hrs]

Advances in Metrology: Universal Measuring, Applications of LASER in measurement, Metro scope, Automatic inspection system. [03 hrs]

Term Work:

It shall consist of various assignments and practical based on above syllabus.

List of Experiments:

Mechanical Measurement (Any five)

1) Study of Generalized Measurement System with typical instrument.

2) Temperature measurement using Thermocouple, Themister and Pyrometers.

3) Experiment on pressure measurement:- U-tube manometer, Bourdon tube, DeadWeight tester.

4) Flow measurement using Rota meter / Water meter.

5) Angular speed measurement using stroboscope, pickups and tachometers.

6) Experiment on Force / Torque measuring instruments:- Spring balance, Proving ring, Dynamometer.

7) Study of LVDT.

Metrology (Any five)

1) Study of precision measuring instruments for linear measurement.

2) Study of comparator of different types.

3) Experiment on sine bar for measurement of taper angle.

4) Study of autocollimator/angle dekkor

5) Study and applications profile projector and Tool maker's microscope.

6) Measurement of screw thread using floating carriage micrometer.

7) Measurement of gear tooth thickness by gear tooth vernier caliper.

8) Assignment on design of gauges.

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. Beckwith & Buck, Mechanical Measurement, - McGraw Hill publication,2009.
2. R. K Jain, Mechanical Measurement, - Khanna publication, New Delhi.

Reference Books:

1. Donald P. Eckman, Industrial Instrumentation, Wiley eastern Ltd.
2. Dobler, Metrology,Tata McGraw Hill Co. New Delhi.
3. R.K. Jain, Engineering Metrology, Khanna Publishers.
4. D.S. Kumar, Mechanical Measurement and control, Metropolitan Book Company, 1979

PCC-ME204 –Manufacturing Processes-I

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC-ME204	**Contact Hours/Week:** Th.03, Pr.02

Course Objectives:

1. To make acquaintance of foundry processes pattern making and casting.
2. To demonstrate metal forming processes such as forging, rolling, extrusion and wire drawing.
3. To demonstrate different plastic molding processes.
4. To make familiar with metal joining processes.

Course Outcomes: At the end of course, students will be able to;

CO1. Classify the manufacturing processes.
CO2. Demonstrate the knowledge of primary manufacturing processes.
CO3. Select the manufacturing process for the particular engineering components.
CO4. Analyze foundry practices like pattern making, mold making, core making and inspection of defects.
CO5. Analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
CO6. Demonstrates knowledge of various Joining processes.

Articulation Matrix

PO/PSO ➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3												3	
CO2	3									2				
CO3	2													
CO4	2	1											2	
CO5	2												2	
CO6	2									2				

Evaluation Scheme:

Theory	**Practical**
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Introduction: Concept of Manufacturing Process, Classification of manufacturing process [02 hrs]

Unit 2

Casting: Introduction to casting process and steps involved. Verities of component produced by casting process. Special molding and casting processes – Lost Foam Process, Shell Molding, Investment casting, Die casting, Centrifugal casting, and Continuous casting. Melting, Pouring and Feeding. Furnaces – Types – Cupola - Construction, operation, zones, Chemistry, etc. Gating system, advantages and limitations of casting process. Pattern Making, Molding and Casting: Sand casting, pattern types, materials, pattern making allowances, molding sand types, properties and testing, hand and machine molding process and equipment's, core type and manufacturing**.** Design of casting: Solidification and

Cooling, Riser and Gating design, design consideration in casting. Cleaning and Inspection of casting: Defects in casting. Inspection and Testing, NDT methods. [14 hrs]

Unit 3

Processing of Plastics: Introduction of plastic molding – Various plastics molding processes and materials [02 hrs]

Unit 4

Welding: Arc welding- Theory, SMAW, GTAW, GMAW, FCAW, Submerged arc welding, Stud welding Resistance welding- Theory, spot and seam projection welding processes Gas welding Friction welding, Ultrasonic welding, Thermit welding, EBW and LASER welding. Use of adhesive for joining, classification of adhesives, types of adhesive and their application, surface preparation and various joints welding defects and quality. [12 hrs]

Unit 5

Hot and Cold Working of Metals: Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, and effect of hot working. Cold working processes, Cold rolling, swaging, forging, extrusion- forward, backward and impact roll forming, tube drawing, wire drawing, spinning, shot penning, high energy rate forming [12 hrs]

Term Work:

The term work shall include numerical assignments and study assignments on below mentioned topics:

1. Study of Sand Testing Equipment's
2. Study of Cupola
3. Study of Casting
4. Study of NDT methods
5. Study of Arc Welding
6. Study of Gas Welding
7. Study of Processing of Plastics
8. Study of Metal working processes
9. Pattern making
10. Mould and Core Making
11. One Job on welding

(While writing study assignments it is desirable to visit laboratory/industrial set up in addition to referring the text and reference books.)

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. P. N. Rao – "Manufacturing Technology (Foundry, Forming and Welding)" 2nd Edition (TMH)

Reference Books:

1. Chapman W.A.-"Workshop Technology, Vol. I, II, & III", Edward Arnold Pub. Ltd. London.
2. Serope Kalpakjian– "Manufacturing Engineering and Technology" – Prentice Hall, Sixth Edition.
3. HMT Hand book- Production Technology
4. Roy A. & Linberg- "Processes and materials of manufacturing", Prentice Hall of India Delhi.
5. Hajara Choudhari, Bose S.K. – Elements of workshop Technology Vol. I &II , Asian Publishing House

PCC-ME205 – Materials Engineering

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC-ME205 (L- 03, T- 0, P- 2, C-03)

Course Objectives:

1. To provide students an understanding of intern-relationship between composition, structure and properties of engineering materials
2. To develop the ability among the students to understand phase diagrams of different materials.
3. To provides students an understanding of various heat treatment and the powder metallurgy processes.
4. To make student familiar with need and application of composite materials.

Course Outcomes: At the end of course students will be able to;

CO1. Demonstrates the knowledge for manufacturing of steels and cast irons.

CO2. Apply knowledge for selecting/manufacturing particular ferrous non ferrous materials for various applications.

CO3. Select appropriate heat treatment for metals and alloys for particular application.

CO4. Possess knowledge about powder metallurgy process and its applications.

Articulation Matrix

PO/PSO ➡ CO ⬇	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3		1				3			3			3	
CO2	3						2						2	
CO3	3	2					2						2	
CO4	3	2					2						2	

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	Continuous Evaluation: 50%
End Term: 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Engineering Materials: Overview of Metallic Materials: Ferrous and non ferrous metals, Ceramics: Traditional and engineering ceramics, Polymers: Traditional and special polymers, Composites: Ceramic - metal - polymer composites. [5 hrs]

Unit 2

Steel Making: Pig iron Production, Steel making processes: Basic oxygen, Electric arc. [3 hrs]

Unit 3

Plain Carbon and Alloy Steels: Lever rule, Iron - Carbon equilibrium diagram, Critical temperatures, Microstructures of slowly cooled steels, Non-equilibrium cooling of steels, Classification and applications of steel, Specifications of steels, Transformation products of austenite, TTT diagram, Effects of alloying elements and examples of alloy steels, Stainless steels, Tool steels. [08 hrs]

Unit 4

Cast Irons: Classification of Cast irons Gray cast irons, Nodular cast irons, White cast irons, Malleable cast irons, Chilled and Alloy cast irons , Effect of various parameters on structure and properties of cast irons, Applications of cast irons. [6 hrs]

Unit 5

Heat Treatment of Steels: Heat treatment of steels, Cooling media. Annealing, Normalizing, Hardening, Retention of austenite, Tempering, Secondary hardening, Temper brittleness, Quench cracks, Hardenability, Carburizing, Nitriding, Carbonitriding, Flame and Induction hardening. Commercial heat treatment practice of gears of different sizes, tools, lathe beds, springs, etc. [7 hrs]

Unit 6

Engineering Non-Ferrous Metals: Copper and copper alloys, Brasses, Aluminum and Aluminum alloys, Nickel and Nickel alloys, Tin and tin alloys and Bearing materials. [5 hrs]

Unit 7

Powder Metallurgy: Sintered structural components, Advantages and Limitations of powder metallurgy, Powder manufacture, Testing and Characterization, Manufacturing of typical P/M products: Self-lubricating bearings, Cemented carbides, Cermets. [6 hrs]

Term Work:

1. It shall consist of various assignments on above syllabus.
2. It shall consist of a journal based on the below mentioned laboratory/study experiments.

List of Experiments:

The term work shall consist of following laboratory/study experiments

1. Study of metallurgical microscope.
2. Preparation of specimen for microscopic examination by mounting.
3. Study of microstructure of plain carbon steels of various compositions.
4. Study of microstructure of various types of C.I.
5. Study of microstructure of various types of alloy steels.
6. Study of microstructure of non – ferrous metals and their alloys.
7. Determination of hardenability of steel material by Jominy End Quench test.
8. Study of surface hardening processes and microstructures.

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus and practical.

Text Books:

1. V. D. Kodgire, "Material Science and Metallurgy For Engineers" Everest Publication House.

Reference Books:

1. V. Raghavan, “Physical Metallurgy Principles and practice”.
2. R. Balasubramanium, "Callister's Materials Science and Engineering" Wiley.
3. Sidney H. Avner, “Introduction to Physical Metallurgy”,Tata McGraw-Hill Education, 1997
4. R. Higgnis, “Engineering Metallurgy Applied Physical Metallurgy, Sixth Edition,

HMC278 – Human Values and Professional Ethics

(CREDITS THEORY: 02, PRACTICAL: 00)

Course code: HMC 278	(L- 02, T- 0, P- 0, C-02)

Course Objectives:

1. To create an awareness on Professional Ethics and Human Values.
2. To help students understand the Harmony for life.
3. To understand co-existence.
4. To study the moral issues and decisions confronting individuals and organizations in profession.

Course Outcomes: At the end of course, student will be able to;

CO 1 Understand the core human values that shape the ethical behavior of a person.

CO 2 Understand how values act as an anchor of actions for life.

CO 3 Learn the need of Human values and Professional ethics in life.

CO 4 Understand Harmony at Four levels of life.

CO 5 Learn the moral issues and problems in profession and find the solution to those problems.

Articulation Matrix

PO ➡ CO ⬇	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
CO-1			1			2		3						
CO-2								3						
CO-3								3				3		
CO-4						2		3						
CO-5			1			2		3	2			3		

Evaluation Scheme:

Theory
Mid Term: 30 Marks
End Term: 50 Marks
In Semester Evaluation: 20 Marks

Content:

Unit 1

Course introduction:

Need, basic guidelines, content and process for value education, Moral values, Social, Environmental, Economic values, Purusharth, Duty, Justice, Equality. A look at basic aspirations: self exploration, happiness and prosperity, Fulfillment of human aspirations.

Unit2

Understanding the harmony:

Thoughtful human being harmony, sentient, attitude and its importance in relationship, significance of restraint and health *(Yama and Niyama)*, Egoism, Altruism, Universalism (idea of Sarvodaya and Vasudevkutumbakam), The problem of hierarchy of values and their choice (View of Pt Madan Mohan Malviya and Mahatma Gandhi), human goal settings and life management techniques.

Unit 3

Understanding professional ethics:

Harmony at various levels and understanding professional ethics, creating environmentally aware engineers, humanistic universal education, humanistic universal education, natural acceptance of human values, ethical human conduct.

Unit 4

Competence of professional ethics

Management models for present technologies, strategies for integrating humans in family and at all levels of existence, relevance of the above strategies in becoming responsible engineers, technologists and managers.

Unit 5

Motivation

Contribution of ancestors in science and technology development to raise self esteem in Indian context.

Text Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education, 2009.

Reference Books:

1. Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak, 1998.
2. Sussan George, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
3. L. Dhar, R. R. Gaur, Science and Humanism, Commonwealth Purblishers, 1990.
4. A. N. Tripathy, Human Values, New Age International Publishers, 2003.
5. Subhas Palekar, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000.
6. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, Limits to Growth – Club of Rome's report, Universe Books, 1972.
7. E. G. Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
8. M. Govindrajran, S. Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

BSC274–MATHEMATICS-IV: Statistical and Numerical Methods

(CREDITS THEORY: 03, PRACTICAL: 0)

Course code: BSC274	(L-03, T-0, P-0, C-03)

Course Objectives:

1. To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
2. To understand probability distributions and their properties
3. To learn the statistical parameters for different distributions, correlation and regression
4. To understand the method of curve fitting, testing of hypothesis, goodness of fit
5. To understand the interpolation and approximation, Numerical differentiation and numerical integration.
6. To learn various numerical techniques to solve ordinary and partial differential equations

Course Outcomes: After successful completion of this course student will be able to:

CO1. To develop techniques of data interpretation.

CO2. Develop problem solving techniques needed to accurately calculate probabilities and describe the properties of discrete and continuous distribution functions.

CO3. Use statistical tests in testing hypotheses on data.

CO4. Compute co-variances, and correlations, Apply the tests of goodness of fit.

CO5. Develop the numerical skills for finding roots of polynomial and transcendental equations.

CO6. Conduct numerical integration and differentiation.

CO7. To use numerical methods to solve ODE's and PDE's and engineering problems.

Articulation matrix

PO ➡ / ⬇ CO	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
CO 1	3	3										2		
CO2	3	3	2									2		
CO3	3	3		3		1						2		
CO4	3	3	2	2		1					1	2		
CO5	3	3	2	2								2		

Evaluation Scheme:

Continuous Evaluation	**Theory**
Before Mid Term: 10 Marks	Mid Term: 30 Marks
After Mid Term: 10 Marks	End Term: 50Marks
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Analysis of Statistical Data (03 hours)

Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion.

Unit 2

Random variables and Probability Distributions (08 hrs)

Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial,

Poisson and Normal distributions and applications.

Unit 3

Sampling Distributions and Interval of Estimation (08 hours)

Sampling Distributions: t distribution, Chi-square distribution, F-distribution,; Interval of estimation

Unit 4

Testing of Hypothesis (08 hours)

Relation between confidence interval and testing of hypothesis; testing of hypothesis, classification of hypothesis tests; large sample tests, small sampe tests.

Unit 5

Numerical Methods – 1(08 hours)

Solution of polynomial and transcendental equations – Newton-Raphson method and Regula-Falsi method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Unit 6

Numerical Methods – 2 (10 hours)

Numerical solutions to differential equations: Taylor series method, Euler method, Runge-Kutta method, predictor-corrector methods for initial value problems, Adams-Moulton method, Numerical solutions to partial differential equations: Finite difference method, Explicit, implicit, Crank-Nicolson method.

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, 2015.
2. Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 7th Edition, McGraw Hill.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI learning Pvt. Ltd.
4. V. K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 2nd Edition.
5. D. C. Montgomery and G.C. Runger, "Applied Statistics and Probability for Engineers", 5th edition, John Wiley & Sons, (2009).
6. P. S. Mann, Introductory Statistics, Wiley Publications, 7th edition (2013).

BSC261 – Mathematical Foundation for Engineering

(CREDITS THEORY: 00, PRACTICAL: 00) Mandatory Audit course for DSE

Course code: BSC261	(L- 02, T- 0, P- 0, C-0)

Course Objectives:

1. To develop the sound conceptual understanding of Algebra, coordinate geometry, complex numbers , vectors, matrices, Calculus and Differential Equations.
2. To develop the foundation for engineering mathematics and other engineering courses.

Course Outcomes: At the end of course student will be able to;

CO1 analyze the structure of complex numbers, quadratic equations, vectors and matrices and their uses.
CO2 Find the standard and general equations of lines, circles, conic sections, and their properties.
CO3 Sketch the graphs of functions and can evaluate limit, continuity, derivatives, integrations.
CO4 Formulate and solve first order differential equations.

Articulation Matrix

PO → / CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	1	2								2
CO2	3	3	1	2								1
CO3	3	3										1
CO4	3	3	2									2

Note: 1-Low, 2-Medium or 3- High

Course Content

Unit-1 Complex Numbers (05 hours)
Complex numbers as ordered pairs. Argand's diagram. Triangle inequality. Powers and roots of complex numbers, De Moivre's Theorem.

Unit-2 Algebra (05 hours)
Quadratic equations and express-ions. Permutations and Combinations. Binomial theorem for a positive integral index.

Unit-3 Coordinate Geometry (07 hours)
Coordinate Geometry: Locus. Straight lines. Equations of circle, parabola, ellipse and hyperbola in standard forms. Parametric representation.

Unit-4 Vectors and Matrices (08 hours)
Addition of vectors. Multiplication by a scalar. Scalar product, cross product and scalar triple product with geometrical applications. Matrices and Determinants: Algebra of matrices. Determinants and their properties. Inverse of a matrix. Cramer's rule.

Unit-5 Differential Calculus (10 hours)

Function. Inverse function. Elementary functions and their graphs. Limit. Continuity. Derivative and its geometrical significance. Differentiability. Rules of derivatives, Applications of Derivatives: Tangents and Normals, Increasing and decreasing functions. Maxima and Minima

Unit-6 Integral calculus (10 hours)

Integration as the inverse process of differentiation. Integration by parts and by substitution. Definite integral and its application to the determination of areas (simple cases). Solving first order differential equations:Exact differential equations and first order linear differential equations.

References:

1. Bernard and Child, Higher Algebra, Macmillan and Co. Pvt. Ltd, New York.
2. J.V. Uspensky, Theory of equations, macGraw Hill Publications.
3. S. L. Loney, The Elements of Coordinate Geometry, Macmilliams and Co., New York
4. G.B.Thomas, M.D.Weir, J. Hass, Thomas' calculus, 12th edition, Pearson Publications

H.Anton, C. Rorrers, Elementary Linear Algebra Applications version, 9th edition, Wiley publications.

PCC-ME206 – Applied Thermodynamics

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC- ME206 (L- 03, T- 0, P- 2, C-03)

Course Objectives:

3. To get conversant with steam engineering.
4. To understand the chemistry of combustion and analysis of combustion products.
5. Estimate the efficiency of the various engines working on Otto, Diesel, Dual Combustion type of cycles
6. To understand compressors and its efficiency.
7. Acquire the knowledge about Steam Nozzles

Course Outcomes: At the end of course student will be able to;

CO 1 Demonstrates the knowledge in estimating the efficiency of the various engines working on Otto, Diesel, and combustion type of cycles.

CO 2 Calculate the calorific values of different fuels.

CO 3 Analyze the basic, reheat steam cycles in order to carry out calculations on system performance.

CO 4 Evaluate the single and multistage reciprocating air compressor cycles in order to carry out calculations on machine performance

Articulation Matrix

PO/PSO ➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3	2								2			2	
CO2	3	2												
CO3	3	2			2								2	
CO4	3	2	2	2	2							2	2	

Evaluation Scheme:

Theory	**Practical**
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: 50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit1

Fuels and Combustion: Types of fuels, calorific values of fuels and its determination, combustion equation for hydrocarbon fuel, determination of minimum air required for combustion and excess air supplied conversion of volumetric analysis to mass analysis, fuel gas analysis. [06 hrs]

Unit 2

Steam Generators: Classification of boilers, boiler details, requirements of a good boiler, merits and demerits of fire tube and water tube boilers, boiler mountings and accessories. Boiler Draught: Classification of draught, draught losses. [08 hrs]

Unit 3

Vapor and gas power cycles: Carnot cycle, ideal Rankine cycle, calculation of thermal efficiency, specific steam consumption, work ratio, Air standard Otto, Diesel and Dual cycle, Strirling cycle, Joule-Brayton cycle [08 hrs]

Unit 4

Steam Nozzles: Types of Nozzles, flow of steam through nozzles, condition for maximum discharge, expansion of steam considering friction, super saturated flow through nozzles, General relationship between area, velocity and pressure. [08 hrs]

Unit 5

Steam Turbines: Advantages and classification of steam turbines, Condensers and Cooling Towers advantages of using condensers, types of condensers, cooling towers. [06 hrs]

Unit 6

Air compressors: classification of air compressors, Terminology, single stage reciprocating air compressor, performance of single stage & multistage air compression, advantages and disadvantages, two stage air compressor with perfect intercooling & imperfect intercooling, minimum work required for a two stage compressor with perfect intercooling, Comparison between reciprocating and rotary compressors, classification of rotary compressors, roots blower compressor, vane blower compressor, centrifugal compressor, comparison between centrifugal and axial compressor [08 hrs]

Term Work:

It shall consist of various assignments and practical based on above syllabus

List of Experiments:

To perform following experiments (Minimum 8);

1. Determination of calorific value of solid/liquid fuel by using Bomb calorimeter.
2. To determine calorific value of gases fuel by Junkers Gas Calorimeter.
3. To determine the dryness fraction of wet steam by using Separating throttling calorimeter
4. Study of Cochran boiler.
5. Study of Babcock and Wilcox boiler.
6. Study of Lancashire boiler.
7. Study of Locomotive boiler.
8. Study of boiler mountings and accessories.
9. To determine volumetric, isothermal efficiency of rotary air compressor.
10. To study cooling tower and find its efficiency.
11. To determine volumetric, isothermal & isentropic efficiency of two stage reciprocating air compressor.

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. P. K. Nag, “Engineering Thermodynamics”, Tata McGraw Hill Publishing Company Ltd. New Delhi.

Reference Books:

1. Yunus A. Cengel, “Thermodynamics- An Engineering Approach, “ Tata McGraw Hill

2. R. K. Rajput, “Thermal Engineering”, Laxmi Publications Pvt. Ltd, New Delhi.
3. B. K. Sarkar, “Thermal Engineering”, Tata McGraw Hill Publishing Company Ltd. New Delhi.

PCC-ME207–FLUID MECHANICS & HYDRAULIC MACHINES

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC- ME 207 | L:03, T:0, P:02, C03

Course Objectives:

1. To familiarize the students with fluid statics and fluid dynamics.
2. To find the losses occurs in flow through the pipes.
3. To demonstrate the types of flows and equation of continuity.
4. To introduce the concepts of the working and design aspects of hydraulic machines like turbines and pumps and their applications.

Course Outcomes: At the end of course student will be able to;

CO1. Demonstrates basic knowledge on fluid statistics,fluid dynamics, closed conduit flows.

CO2. Classify and demonstrate basic knowledge about turbines and pumps

CO3. Design various components of pumps and turbines.

CO4. Evaluate efficiency of different pumps and performance of the pumps with determination of characteristics curves.

Articulation matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3						2		2	2			3	
CO2	3						2		2	2			2	
CO3	3	3	2	2	2		1						2	2
CO4	3	3	3	2	2		1						2	2

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: :50%
In Semester Evaluation: 20 Marks	

Unit1

Fluid Statics: Dimensions and Units, Physical properties of fluids – mass density, specific weight, specific volume, specific gravity, viscosity, surface tension, vapour pressure and their influence on fluid motion. Atmospheric pressure, gauge pressure and vacuum pressure, measurement of pressure – Piezometers, U-tube and differential manometers – mechanical pressure gauges. [06 hrs]

Unit2

Fluid Kinematics: Stream line, path line and streak lines and stream tubes. Classification of flows ideal fluid and real fluid – steady and unsteady flows, uniform and non-uniform flows, laminar and turbulent flows, rotational and irrotational flows, equation of continuity for one-dimensional flows [06 hrs]

Unit3

Fluid Dynamics: Various forces acting on a fluid element- Euler's and Bernoulli's equation for flow along a streamline, momentum equation and its applications for pipe bend problem. Closed conduit flow – Reynolds number, Reynolds experiment – "Darcy –Weisbach" equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line, measurement of flow: Pitot tube, venturimeter, orificemeter and flow nozzle meter. [06 hrs]

Unit 4

Basics of Turbo Machinery: Hydrodynamic force on jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes. [06 hrs]

Unit 5

Hydraulic Turbines : Classification of turbines – Impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working principles, workdone, efficiencies, hydraulic design, draft tube theory, functions and efficiency [06 hrs]

Performance of Hydraulic Turbines: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer. [05 hrs]

Unit 6

Centrifugal and Reciprocating Pumps: Classification working of centrifugal pump, work done – manometric head – losses and efficiencies – specific speed – pumps in series and parallel – performance characteristic curves, NPSH. Working of reciprocating pumps, discharge, slip, percentage slip, Indication diagrams. [10 hrs]

Term Work:

It shall consist of various assignments and practical based on above syllabus.

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. Dr. R.K. Bansal "A Text book of Fluid Mechanics and Hydraulic Machines", 9th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2010.

Reference Books:

1. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", 2nd Edition, SK. Katania and Sons, 2010.
2. P.N. Modi and S.M. Seth "Hydraulics, fluid mechanics and hydraulic machinery", 14th Edition, Standard Book House, New Delhi 2002.
3. A.K.Jain, "Fluid Mechanics Including Hydraulic Machines", 8th Edition, Khanna Publishers, New Delhi, 2003.
4. Cengel and Cimbala ," Fulid Mechanics Fundamentals and Applications"McGraw-Hill

PCC-ME208 – Machine Drawing and CADD

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ESC-ME208	(L-03, T-0, P-02, C-03)

Course Objective:

1. To make the students understand and interpret drawings of machine components
2. To prepare assembly drawings both manually and using standard CAD packages
3. To familiarize the students with various standards on drawing practices and standard components
4. To impart practical experience in handling 2D/3D drafting/modeling software systems.

Course Outcomes: At the end of course student will be able to;

CO1. Identify the elements of a drawing and create a simple drawing complete with annotations.
CO2. Analyze a bill of materials and create a typical drawing sequence numbers.
CO3. Construct a set of machine assembly including assembly drawings, part specifications, and general notes.
CO4. Evaluate various part drawing and its dimensions, limits fits & tolerances from a Assembly drawing.
CO5. Create a 3D/2D CAD models by using CAD software.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3	2	2								1		3	
CO2	3	2	2										3	2
CO3	3	2	2	2								2	2	3
CO4	3											2	3	3
CO5	3				3							2	2	2

Evaluation Scheme:

Theory	**Practical**
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: :50%
In Semester Evaluation :20 Marks	

Course Content:

Unit 1

Introduction: Introduction to machine drawing, Computer aided drafting and documentation (CADD) [02 hrs]

Conventions: Conventional representation of standard machine parts, thread profiles and welded joints along with their actual drawings, Conventional representation for various types of springs and gears. Representing limits, fits and tolerances, Representation of Surface Roughness and Textures. [05hrs]

Unit 2

Production Drawing: Introduction, Types of production drawings, Detailing or Part Drawings, Working Assembly Drawings, Examples. [05 hrs]

Unit 3

Machine Parts: Screwed Fastenings: Locking Arrangement of Nuts, Foundation Bolts. Pipe Joints: Flanged, Socket and Spigot Joints, Hydraulic, Union Joints, Expansion Joints and Stuffing Box. Riveted Joints: Single and Double Riveted Butt and Lap Joints, Keys, Cotter Joints; Knuckle Joint. [08 hrs]

Unit 4

Assembly and detail drawing : Assembly and detail drawing with complete dimensioning, tolerance, materials and surface finish of different small machines and machine components [08 hrs]

Unit 5

Computer Aided Drafting and Documentation: Introduction, Required Equipment, Starting AutoCAD, planning for a drawing, types of modeling, Isometric drawing, Basic dimensioning [08 hrs]

Unit 6

Using AutoLISP: Using AutoLISP to Communicate with AutoCAD, Using AutoLISP to create AutoCAD Objects, Using Autocad Scripts, Introduction to Autocad VBA. [8 hrs]

Term Work:

The term work shall consist of record of Computer aided drafting assignments, drawing sheets and sketch book based on the above syllabus.

List of Experiments:

Minimum six Practicals shall be performed consisting of the following:

1. Conventional representation of Symbols.
2. Pencil Drawings of some standard components. (e.g. Screw Fasteners)
3. Pencil Drawings of standard assemblies with components.(e.g. Couplings)
4. Pencil Drawing of a small assembly with components (e.g. Screw Jack)
5. Pencil Drawings of detailed drawings of Assembly
6. Computer Print out of 2D drafting (assembly or detail) using CAD software.

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus.

Text Books:

1. Dr. Dhawan,"A Text Book of Machine Drawing," S. Chand publications 2014

Reference Books:

2. N.D. Bhatt & V.M. Panchal, "Machine Drawing," - Charotar Publishing House, 2001
3. G. Pohit and G. Ghosh, Machine Drawing with AutoCAD –Pearson Education, 2005
4. P.S. Gill, Machine Drawing - S. K. Kataria and Sons, Delhi, 2002
5. Tutorials, manuals and documentation of CAD software.
6. Auto CAD & Autolisp Manuals by AutoDesk Corp., USA

PCC-ME209 –Manufacturing Processes-II

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC- ME209	(L-03, T-0, P-02, C-03)

Course Objective:

1. To impart the fundamentals of metal cutting process.
2. To inculcate the concepts of different machining processes.
3. To motivate the students to get known construction, working and applications of various machine tools.
4. To make familiar with concepts and working of non conventional machining process.

Course Outcomes: At the end of course student will be able to;

CO1. Demonstrate the metal cutting process and select the appropriate cutting tools for it.
CO2. Exhibit the characteristic, terminologies related to cutting tools.
CO3. Calculate the machining time, depth of cut, feed required.
CO4. Demonstrate knowledge related to various machining processes.
CO5. Exhibits the knowledge of various finishing processes.
CO6. Select proper machining processes for the product to be manufacture

Articulation Matrix

PO/PSO ➡ ⬇ CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3												3	
CO2	3									2				
CO3	2													
CO4	2	1											2	
CO5	2												2	
CO6	2									2				

Evaluation Scheme:

Theory	**Practical**
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: :50%
In Semester Evaluation: 20 Marks	

Course Content:

Unit 1

Introduction:

Definition, principles, types, components, machining parameters, drives and power requirements. [02]

Theory of Metal Cutting:

Metal cutting process, Orthogonal cutting and force diagram, Tool geometry of single point cutting tool, tool signature, Merchant's circle, Force measurement by dynamometers, effect of tool angles on machining, Tool materials - properties, selection and applications. Chip-formation, types of chips, built-up-edge, chip breakers. Cutting Tool Materials, Machinability, Factors affecting machinability index, Tool Life, Factors affecting tool life, Taylor's equation, types of tool failures, tool wears, Tool condition monitoring. [10]

Unit 2

Turning: Turning and Boring, Lathe: construction, accessories and operations, concept of speed,

feed and depth of cut, Thread cutting: single and multi-start threading. Introduction to Boring Machines, Capstan and Turret lathe. [06]

Unit 3

Drilling: Fundamentals of drilling processes, introduction to multi-point cutting tools, drill geometry, tool holder, types of drill, types of drilling machines, operations performed on drilling machines. Reaming processes and reamer types. [06]

Unit 4

Milling, Shaping and Planing: Fundamental aspects, cutter types and geometry, Operations performed on milling machine, dividing head method of indexing. Construction, working and operations performed on shaper, planer, and broaching machines, Introduction to Gear Manufacturing. [06]

Unit 5

Finishing and Super Finishing: Grinding wheels, wheel marking, wheel selection, wheel mounting, types of grinding machines. Honing, lapping, super finishing, buffing and burnishing processes. [06]

Unit 6

Non-Conventional Machining: Introduction, Classification. Principle, Working and Applications of Chemical Machining, Electrochemical Machining, Electric Discharge Machining (EDM), Wirecut EDM, Abrasive Jet Machining and types, Laser Beam Machining, Plasma Arc Cutting.[06]

Term Work:

Each candidate shall be required to complete and submit the following term work.

Part A: One composite job consisting of Turning, Facing, Threading, Parting, Drilling and Boring operations.
Part B: One job should be made on any one non-conventional machining process.

Practical Examination: Practical examination consists of practical/ oral examination based on above syllabus.

Text Books:

1. P. N. Rao – "Manufacturing Technology (Metal Cutting and Machining Tools)" 2nd Edition (TMH)

Reference Books:

1. Serope Kalpakjian– "Manufacturing Engineering and Technology" – Prentice Hall, Sixth Edition.
2. HMT Hand book- Production Technology
3. Amitabha Ghosh and Asok Kumar Mallik, Manufacturing Science, 1985, Affiliated East West Press Pvt. Ltd., New Delhi.
4. R. K. Jain, 'Production Technology', Khanna Publications.
5. Chapman, "Workshop technology" Vol. I, II & III; Edward Arnold Publications Ltd. London.
6. Hajara Chaudhary S. K., "Workshop Technology" Vol. I & II, Media Prom & Publication, Mumbai.

PCC-ME210-Kinematics and Theory of Machines
(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: PCC- ME210 | (L-03, T-0, P-02, C-03)

Course Objective:

1. To make the student conversant with commonly used mechanism for industrial application.
2. To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism
3. To develop an ability to design gear drive and cam profile for given application.
4. To impart the knowledge of working of flywheel, governor and gyroscope.

Course Outcomes:

CO1. Demonstrate the working of different mechanisms.
CO2. Evaluate velocity and acceleration of mechanisms by graphical methods.
CO3. Demonstrate the kinematics of cams and followers, flywheel, governors, and their characteristics and also design cams and followers for specified motion profiles.
CO4. Design gear tooth geometry and select appropriate gears for the required applications.
CO5. Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2
CO 1	3								2	2			3	
CO2	3	3	3	2									2	2
CO3	3	2	2	2	2								2	2
CO4	3	2	3	3									2	3
CO5	3	2	2	2	2								2	2

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation: 50%
End Term : 50 Marks	Continuous Evaluation: :50%
In Semester Evaluation :20 Marks	

Course Content:

Unit 1:

Fundamentals of kinematics and mechanisms

Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion, Inversion, Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. [6 hrs]

Unit 2

Velocity and acceleration analysis

Velocity and acceleration analysis of mechanisms with single degree of freedom system using graphical method, Instantaneous center, Kennedy's theorem, Velocity analysis of mechanisms using instantaneous centre method. [12 hrs]

Unit 3

Cam

Introduction, Types of Cams, Types of followers, Follower motions, viz. Simple Harmonic Motion, Constant Velocity, Uniform Acceleration & Retardation, Cycloidal motion, layout of Cam profile for specified displacement characteristics. Cams with Oscillating follower system. [6 hrs]

Unit4

Gears

Classification, Gear Terminology, Law of Gearing, profiles used in gears, Length of path of contact, Arc of contact, contact ratio, Interference of involutes teeth, methods of preventing interference and under cutting. [6 hrs]

Unit 5

Flywheel & Governors

Turning Moment Diagram for single cylinder & multi-cylinder engine, Flywheel and its applications. Introduction, types of governors- Porter, Proell and Hartnell governor. [6 hrs]

Unit 6

Gyroscope

Gyroscopic couple, Effect of precision motion on the stability of moving vehicles such as motor car, motor cycle, air plane and ship. [4 hrs]

Term Work:

It shall consist of various assignments on above syllabus

List of Drawing Sheets

1. One drawing sheet consisting of two problems on Velocity analysis by instantaneous centre method.
2. One drawing sheet consisting of two problems on Velocity analysis by relative velocity method.
3. One drawing sheet consisting of two problems on Acceleration analysis.
4. One drawing sheet consisting of two problems on Cam.

List of Experiments:

The term work shall consist of journals on following laboratory experiments

1. To Plot Relevant Displacements Between Crank and Rocker in Four Bar Mechanism
2. To Plot Relevant Displacements Between Crank and Slider in Slider Crank Mechanism
3. To Plot Relevant Displacements Between Crank and Slider in Whitworth Quick Return

Mechanism

4. To Plot Relevant Displacements Between Crank and Slider in Scotch Yoke Mechanism
5. To Determine Coriolli's Component of Acceleration Theoretically and Experimentally
6. To Determine the Characteristic Curves, Sensitiveness and Range of Speed of Watt Governor
7. To Determine the Characteristic Curves, Sensitiveness and Range of Speed of Porter Governor
8. To Determine the Characteristic Curves, Sensitiveness and Range of Speed of Proell Governor
9. To Determine the Characteristic Curves, Sensitiveness and Range of Speed of Hartnell Governor
10. To Determine Gyroscopic Couple on Motorized Gyroscope

Practical Examination:

End Term Examination shall be a practical /oral examination based on above syllabus and practicals.

Text Books:

1. Rattan, S.S, "Theory of Machines", 2nd Edition, Tata McGraw-Hill, Publishing Co. Ltd., New Delhi, 2006.

Reference Books:

1. Bevan T., "Theory of Machines: A text book for engineering students", 3rd Edition, CBS, NewDelhi.
2. Uicker Jr, J. J., Penock G. R. and Shigley, J. E. "Theory of Machines and Mechanisms' 3 rd Edition,Oxford University Press, Tata McGraw Hill. 2005.
3. Ballaney, P. "Theory if Machines and Mechanisms", Khanna Publications.
4. John Hannah and Stephens, R. C., "Mechanics of Machines: Advanced Theory and Examples", 1970, Hodder; Student international edition, ISBN 0713132329 Edward Arnold London

MAC277 Indian Constitution
(Mandatory Audit Course)

Course code: MAC-277 (L-02, T-0, P-0, C-0)

Course Objectives:

1. To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.
2. To understanding the importance and the different aspects of the Constitution. To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government.
3. To understand the basis and procedure of amendments.
4. To know the different aspects of the Union and the State Executive.
5. To know how our country was founded, who founded it, what are our rights are, what life was like, how life has changed, how the rights still apply today.

Course Outcomes:

CO 1 Student will be able to understand how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.
CO 2 Student will be able to understand the interpretation of the Preamble.
CO 3 Student will be able to understand the basics of governance of our nation.
CO 4 It helps in understanding the different aspects covered under the different important Articles.
CO 5 Student will be able to understand the basic law and its interpretation. Understand the important amendments which took place and their effects.
CO 6 Student will be able to understand our Union and State Executive better.
CO 7 Student will be able to that along with enjoying the rights one needs to fulfill one's duties.

Articulation Matrix

PO/PSO➡ ⬇CO	a	b	c	d	e	f	g	h	i	J	k	l
CO 1							2	3				2
CO2												2
CO3						2			2			
CO4							2					2
CO5								2				2
CO6						2						
CO7								2				

Evaluation Scheme:

Theory
Mid Term : 30 Marks
End Term : 50 Marks
In Semester Evaluation: 20 Marks

Course Content:

1. Meaning of the constitution law and constitutionalism. Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India.
2. Scheme of the fundamental rights. The scheme of the Fundamental Duties and its legal status.
3. The Directive Principles of State Policy –Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and States.
4. Parliamentary form of Government in India. The constitution powers and status of the

President of India.

5. Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments in India.
6. Emergency Provisions: National Emergency, President Rule, Financial Emergency.
7. Local Self Government – Constitutional Scheme in India.
8. Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article 19. Scope of the Right to Life and Personal Liberty under Article 21.

Text Books:

1. Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice-Hall EEE, 19th /20th Edition, 2001.
2. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.