

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | Accredited by NBA
NAGAPATTINAM – 611 002



B.E.MECHANICAL ENGINEERING

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1902ME301	Engineering Mechanics	2	2	0	3	40	60	100
1902ME302	Manufacturing Technology I	3	0	0	3	40	60	100
1902ME303	Fluid Mechanics & Machines	2	2	0	3	40	60	100
1902ME304	Strength of Materials	2	2	0	3	40	60	100
1902ME305	Thermodynamics	2	2	0	3	40	60	100
Laboratory Course								
1902ME351	Fluid Mechanics & Machines lab	0	0	2	1	50	50	100
1902ME352	Strength of Materials lab	0	0	2	1	50	50	100
1902ME353	Manufacturing Technology I lab	0	0	3	1.5	50	50	100
1904GE351	Life Skills: Soft Skills	1	0	1	1.5	100	-	100
Audit Course								
1901MCX01	Environmental Science	3	0	0	0	-	-	-

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1902ME301	ENGINEERING MECHANICS	L	T	P	C
		2	2	0	3

MODULE I BASIC CONCEPTS AND FORCE SYSTEM 09 Hours

Introduction to mechanics - idealization of mechanics - laws of mechanics - principle of transmissibility - vector - addition, subtraction and product. Force- types - system of forces - resultant forces - composition of forces - resolution of force-free body diagram for real world systems.

MODULE II STATICS OF PARTICLES AND FORCE SYSTEM 09 Hours

Equilibrium of particle in space, moment of couple-equilibrant Moment about point and specific axis-moment at couple- simplification of force and couple systems.

MODULE III STATICS OF RIGID BODIES 09 Hours

Equilibrium of rigid bodies in two and three dimensions - beams - types of loads, supports and their reactions Two and three force Members-Static determinacy.

MODULE IV PROPERTIES OF SURFACES AND SOLIDS 09 Hours

Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of inertia of plane and areas Parallel axis theorem radius of gyration of area- product of inertia- mass moment of inertia.

MODULE V DYNAMICS OF PARTICLES AND FRICTION 09 Hours

Displacement, Velocity and Acceleration their relationship – Relative Motion – Curvilinear motion - Introduction - mechanism of friction-types -laws of friction - friction on horizontal and inclined planes, ladder and wedge friction - rolling resistance.

TOTAL: 45 HOURS

REFERENCES:

1. F.P. Beer, and Jr. E.R Johnston, Vector Mechanics for Engineers - Statics and Dynamics, Tata McGraw-Hill Publishing Company, New Delhi, 2007.
2. N.H. Dubey, Engineering Mechanics- Statics and Dynamics, Tata McGraw-Hill Publishing Company, New Delhi, 2013.
3. Irving H. Shames, Engineering Mechanics - Statics and Dynamics, Pearson Education Asia Pvt. Ltd., 2006.
4. R.C. Hibbeler, Engineering Mechanics: Combined Statics & Dynamics, Prentice Hall, 2009.
5. D. P. Sharma, Engineering Mechanics, Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2010.
6. S. Rajasekaran and G. Sankarasubramanian, Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.
7. <https://nptel.ac.in/courses/112/106/112106286/>

1902ME302	MANUFACTURING TECHNOLOGY – I	L	T	P	C
		3	0	0	3
MODULE I	CASTING PROCESSES				09 Hours
Introduction to production processes and its classifications - Pattern - Types, Materials and Allowances. Moulding sand - Types, Properties and Testing. Moulding machines and its types. Melting furnaces - Cupola and Induction. Fettling and cleaning. Sand casting defects. Special casting processes - Shell moulding, Die casting, Centrifugal casting and Investment casting.					
MODULE II	METAL JOINING PROCESSES				09 Hours
Introduction to welding processes and its classifications - Principle of Gas welding and its flames - Principle of arc welding - Electrodes, Fluxes and filler materials. Principle of Resistance welding - Spot, butt and seam. Principle of Gas metal arc welding, Submerged arc welding, Tungsten Inert Gas welding, Plasma arc welding, Thermit welding, Electron beam welding and Friction welding - Weld defects - Brazing and soldering.					
MODULE III	BULK DEFORMATION PROCESSES				09 Hours
Introduction - Hot and cold working of metals - Forging processes - Open and close die forging, Forging equipment and operations. Rolling - Types of Rolling mills, shape rolling operations, Tube piercing and Defects. Principle of Extrusion and its types. Principle of rod and wire drawing.					
MODULE IV	SHEET METAL FORMING AND SPECIAL FORMING PROCESSES				09 Hours
Introduction - Shearing, bending and drawing operations - Stretch forming operations - Principle of special forming processes - Hydro forming, Rubber pad forming, Metal spinning, Explosive forming, Magnetic pulse forming, Peen forming and Super plastic forming.					
MODULE V	MOULDING AND FORMING OF PLASTICS				09 Hours
Introduction to plastics - Moulding of Thermoplastics - Principle and applications of Injection moulding and its types, Blow moulding, Rotational moulding, Thermoforming and Extrusion. Moulding of Thermosets - Principle and applications of Compression moulding and Transfer moulding Bonding of Thermoplastics - Fusion and solvent methods					
TOTAL: 45 HOURS					

REFERENCES:

1. P. N. Rao, Manufacturing Technology vol. I, Tata McGraw-Hill Publishing Company rivate Limited, New Delhi, 2010.
2. SeropeKalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Education Limited, New Delhi, 2013
3. J. P. Kaushish, Manufacturing Processes, Prentice Hall of India Learning Private Limited, New Delhi, 2013
4. P.C. Sharma, Manufacturing Technology - I, S Chand and Company Private Limited, New Delhi, 2010
5. S K HajraChoudhury, Elements of Workshop Technology - Vol. I, Media Promoters & Publishers Private Limited, Mumbai,2013.
6. <http://nptel.ac.in/courses/112107144/1>.

1902ME303	FLUID MECHANICS AND MACHINES	L	T	P	C
		2	2	0	3

MODULE I INTRODUCTION TO FLUID AND FLUID MOTION 07 Hours

Fluid- Fluid mechanics -Laws of Fluid Mechanics-Properties of fluid and its Application-Types of fluid - Types of fluid Flow-Measurement of Pressure-U-tube and differential manometer- Measurement of velocity using Discharge -Flow characteristics-Momentum -continuity equation.

MODULE II FLUID DYNAMICS AND FLUID FLOW OVER CONDUITS 11 Hours

Forces acting on a fluid element- Eulers and Bernoulli theorem Application in internal and external flows measuring instruments - Major losses and Minor losses in pipes using standard charts and tables pipes in series and pipes in parallel. - Darcy Weisbach equation. Identification of laminar and turbulent flow in closed conduits, flow in circular pipe.

MODULE III DIMENSIONAL AND MODEL ANALYSIS 09 Hours

Need for dimensional analysis - dimensional analysis using Buckingham pi theorem – Similitude - types of similitude - Dimensionless parameters- application of dimensionless parameters - Model analysis through Reynolds and Froudes Model law.

MODULE IV HYDRAULIC TURBINES 09 Hours

Definition of turbine - Classification -Types of head and efficiencies of turbine-Impulse turbine - Reaction turbine-Francis turbine, Kaplan turbine - working principles and velocity triangle- Work done by water on the runner Specific speed - unit quantities performance curves.

MODULE V HYDRAULIC PUMPS 09 Hours

Definition -Centrifugal pump Classification Construction working principle and velocity Triangle Definition of heads-Losses and efficiencies-Multistage Centrifugal pump-Specific speed - Priming and cavitation effects of centrifugal pump. Reciprocating pump Classification Working Principle Coefficient of discharge and slip- Indicator diagram (Descriptive treatment only).

TOTAL: 45 HOURS

REFERENCES:

1. R.K.Bansal, A Textbook of Fluid Mechanics and Machinery, Laxmi Publications Ltd., New Delhi, Revised Tenth edition, 2018.
2. Bruce R Munson , Donald F Young, Theodore H Okiishi and Wade W. Huebsch, Fundamentals of Fluid Mechanics, John Wiley & Sons, Sixth edition 2009.
3. Pijush K Kundu and Ira M Cohen, Fluid Machines, Academic Press, Burlington, United states of america, 2010.
4. YunusCengel and John Cimbala, Fluid Mechanics Fundamentals and Application, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi 2009.
5. Robert and W Fox, Introduction to Fluid Machines, John Wiley Eastern Pvt. Ltd., New Delhi, 6th edition ,2006.
6. <http://nptel.ac.in/courses/112105182/>

1902ME304	STRENGTH OF MATERIALS	L	T	P	C
		2	2	0	3
MODULE I	STRESS, STRAIN AND DEFORMATION OF SOLIDS				09 Hours

Introduction to material properties. Stresses and strains due to axial force, shear force, impact force and thermal effect-stepped and composite bars-uniformly varying cross section. Stress-strain curve for ductile and brittle materials Hooke-law - Factor of safety Poisson-ratio. Elastic constants and their relationship.

MODULE II ANALYSIS OF STRESSES IN TWO DIMENSIONS 09 Hours

State of stresses at a point- Normal and shear stresses on inclined planes - Principal planes and stresses Plane of maximum shear stress - Mohrs -circle for biaxial stress with shear stress. Hoop and longitudinal stresses in thin cylindrical and spherical shells - Changes in dimensions and volume.

MODULE III LOADS AND STRESSES IN BEAMS 09 Hours

Types of beams- Supports and Loads, Shear force and Bending Moment in beams, Cantilever, simply supported and overhanging beams - Point of contra flexure. Theory of simple bending - bending and shear stress - stress variation along the length and section of the beam, Section modulus.

MODULE IV DEFLECTION OF BEAMS AND COLUMNS 09 Hours

Slope and Deflection of cantilever, simply supported ,Double integration method and Macaulay's method. Columns- types- Equivalent length Euler and Rankine formulae- Slenderness.

MODULE V TORSION IN SHAFT AND HELICAL SPRING 09 Hours

Analysis of torsion of circular solid and hollow shafts-stepped shaft-compound shaft- Shear stress distribution, angle of twist and torsional stiffness. Closed coil helical spring- stresses and deflection under axial load- Maximum shear stress in spring section.

TOTAL: 45 HOURS

REFERENCES:

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India Learning Pvt. Ltd, New Delhi, 2010.
2. S.S. Rattan, Strength of Materials, Tata McGraw Hill, Delhi, Second Edition, 2011.
3. D. K. Singh, Mechanics of Solids, Pearson Education New Delhi, 2006.
4. F. P. Beer and R. Johnston, Mechanics of Materials, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, Third edition,2002.
5. B. K. Sarkar, Strength of Materials, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi, Second Reprint, 2007.
6. <http://www.nptel.ac.in/courses/Webcourse-contents/IIT>

1902ME305	THERMODYNAMICS	L	T	P	C
		2	2	0	3

MODULE I INTRODUCTION AND ZEROth LAW OF THERMODYNAMICS 9 Hours

Macroscopic and Microscopic approaches, Definitions and concepts- heat, work, thermodynamic equilibrium, system and types, surroundings, Properties- intensive and extensive properties, Path and point functions, Energy- macroscopic and microscopic modes of energy, Thermodynamic processes and cycle, State postulate, Zeroth law of thermodynamics- temperature scale, perfect gas scale.

MODULE II FIRST LAW OF THERMODYNAMICS 9 Hours

First law of thermodynamics, I law for Closed systems - constant pressure process, constant volume process, constant temperature process, adiabatic process, polytropic process, throttling process. I law for open systems - Steady state flow processes, Steady flow energy equation (SFEE), Application of SFEE-turbines and compressors, nozzles and diffusers, throttling valves, heat exchangers.

MODULE III SECOND LAW OF THERMODYNAMICS 9 Hours

Limitations of I law of thermodynamics, Second law of thermodynamics- Kelvin - Planck and Clausius statements, Heat Engine, heat pump and refrigerator, Reversibility and irreversibility- irreversible and reversible processes, Carnot's principles, Carnot cycle, Carnot engine, Thermodynamic temperature scale, Clausius inequality, Entropy- principle of entropy increase, Availability & irreversibility – Introduction about third law of thermodynamics.

MODULE IV PROPERTIES OF PURE SUBSTANCES 9 Hours

Thermodynamic properties of fluids. Pure substance-phases - Phase change processes, Property diagrams - pressure-volume (P-v), pressure-temperature (P-T), temperature volume (T-v), temperature entropy (T-s) and enthalpy-entropy (h-s) diagrams. Steam tables - Problems on flow and non-flow processes.

MODULE V GAS MIXTURES AND PSYCHROMETRIC PROPERTIES 9 Hours

Thermodynamics of ideal gas mixture- mixture of ideal gas, mixture of perfect gases, Dalton's law of partial pressure, Amagat's law, Thermodynamics properties, Ideal gas – equation of state, Van derWaals equation and compressibility chart. Psychrometric properties and processes – Psychrometric chart.

TOTAL: 45 HOURS

REFERENCES:

1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ", Fifth Edition, 2017.
2. Y. Cengel and Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2003.
3. R.S. Khurmi, Steam table with Psychometric chart, S. Chand Publications, New Delhi,2009.
4. J.P. Holman, Thermodynamics, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi,2002.
5. P.K. Nag, Engineering Thermodynamics, Tata McGraw-Hill, New Delhi, 2007.
6. C.P. Arora, Thermodynamics, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi,2003
7. https://onlinecourses.nptel.ac.in/noc18_ae05/preview.
8. https://onlinecourses.nptel.ac.in/noc18_ch03/preview.

1902ME351	FLUID MECHANICS AND MACHINES LAB	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

1. Experimental verification of Bernoulli's theorem in a pipe flow.
2. Measurement of flow rate using venturimeter and calculate the coefficient of discharge.
3. Measurement of flow rate using orificemeter and calculate the coefficient of discharge.
4. Performance test on tangential flow impulse (Pelton wheel) turbine against constant head.
5. Performance test on Francis turbine against constant head.
6. Performance test on reaction (Kaplan) turbine against constant head.
7. Performance characteristics of a reciprocating pump.
8. Performance characteristics of a gear pump.
9. Performance test on centrifugal pump.
10. Performance test on submersible pump.
11. Determination of loss of head in different pipes (major loss) and fittings (minor loss) for various flow rates.

Total: 30 Hours

REFERENCES:

1. www.cs.cf.ac.uk/Dave/C/
2. <http://www.lysator.liu.se/c/bwk-tutor.html>
3. http://en.wikibooks.org/wiki/Data_Structures/Introduction
4. <http://www.eskimo.com/~scs/cclass/notes/top.html>

1902ME352	STRENGTH OF MATERIALS LAB	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

1. Find the hardness of the material using Rockwell hardness tester.
2. Calculate the hardness of the material using Brinell hardness tester.
3. Experimentally calculate the strain energy of a material subjected to impact loading.(Izod testing)
4. Experimental analysis of an axial bar under tension to obtain the stress strain curve and the strength.
5. Determine the Young-modulus and stiffness of a metal beam through load deflection curve.
6. Experimentally calculate the compressive strength of the materials.
7. Experimentally calculate the double shear strength of the materials.
8. Experimentally calculate the strain energy of a material subjected to impact loading.(charpy testing)
9. Determination of spring constant through load vs deflection curve.
10. Experimental analysis of a bar under torsion to obtain stiffness and angle of twist.

Total: 30 Hours

REFERENCES:

1. Joseph A. Unfener, Robert L. Mott, "A Text Book Of Applied Strength of Materials", sixth Edition.
2. S.S.Bhavikatti, "A Text Book Of Strength of Materials".
3. Esor P. popov, "A Text Book Of Strength of Materials"

1902ME353	MANUFACTURING TECHNOLOGY- I LAB	L	T	P	C
		0	0	3	1.5

LIST OF EXPERIMENTS:

- Taper Turning using Tailstock set over method
- Taper Turning using Compound rest method
- External Thread cutting
- Internal Thread Cutting
- Eccentric Turning
- Knurling
- Push fit
- Clearance fit
- Force fit
- Measurement of cutting forces in turning process
- Simple turning using capstan lathe.

Total: 45 Hours

REFERENCES:

1. P. N. Rao, Manufacturing Technology vol. I, Tata McGraw-Hill Publishing Company Private Limited, New Delhi, 2010.
2. Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Education Limited, New Delhi, 2013.
3. J. P. Kaushish, Manufacturing Processes, Prentice Hall of India Learning Private Limited, New Delhi, 2013.
4. P.C. Sharma, Manufacturing Technology - I, S Chand and Company Private Limited, New Delhi, 2010.
5. S K Hajra Choudhury, Elements of Workshop Technology - Vol. I, Media Promoters & Publishers Private Limited, Mumbai, 2013.
6. <http://nptel.ac.in/courses/112107144/1>.

1904GE351	LIFE SKILLS: SOFT SKILLS	L	T	P	C
		1	0	1	1.5

MODULE I INTRODUCTION TO SOFT SKILLS 06 Hours

Soft Skills an Overview - Basics of Communication – Body Language – Positive attitude –Improving Perception and forming values – Communicating with others.

MODULE II TEAM VS TRUST 06 Hours

Interpersonal skills – Understanding others – Art of Listening - Group Dynamics –Essential of an effective team - Individual and group presentations - Group interactions – Improved work Relationship

MODULE III SELLING ONESELF 06 Hours

How to brand oneself – social media – job hunting – Resume writing – Group Discussion – Mock G.D - .Interview skills – Mock Interview

MODULE IV PROPERTIES OF PURE SUBSTANCES 06 Hours

What is Etiquette – Key Factors – Greetings – Meeting etiquette – Telephone etiquette – email etiquette – Dining etiquette – Dressing etiquette

MODULE V GAS MIXTURES AND PSYCHROMETRIC PROPERTIES 06 Hours

1. My family. Myself. 2. Meeting people. Making Contacts. 3. A city. Getting about town. 4. Our flat. Home life. 5. Travelling. Going abroad. 6. Going through Customs.7. At a hotel. 8. Shopping. 9. Eating out.10. Making a phone call.11.A modern office.12. Discussing business.

TOTAL: 30 HOURS

REFERENCES:

1. Dr.k.Alex, “soft skills “Third Edition, S.Chand& Publishing Pvt Limited, 2009
2. Arunakoneru, ‘Professional Communication’ Second Edition, Tata McGraw-Hill Education, 2008
3. D.K.Sarma, ‘You & Your Career ‘First Edition Wheeler Publishing & Co Ltd, 1999
4. Shiv Khera ‘You Can Win’ Third Edition Mac Millan Publisher India Pvt Limited, 2005

1901MCX01	ENVIRONMENTAL SCIENCE	L	T	P	C
	(Common to all Branches of B.E/ B.Tech)	3	0	0	0

MODULE I ECOSYSTEMS AND BIODIVERSITY 10 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place

MODULE II NATURAL RESOURCES 10 Hours

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Documentation of the effect of modern Agriculture in your nearby Village

MODULE III ENVIRONMENTAL POLLUTION 9 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution - Mitigation procedures- Control of particulate and gaseous emission, Control of SO_x, NO_x, CO and HC) -Technology for capturing CO₂ (metallo organic frame works)(b) Water pollution – Waste water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies.

Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural.

MODULE IV SOCIAL ISSUES AND THE ENVIRONMENT

8 Hours

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management -environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards- disaster management: floods, earthquake- Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India)

MODULE V HUMAN POPULATION AND THE ENVIRONMENT

8 Hours

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – Environmental impact analysis (EIA) -GIS-remote sensing-role of information technology in environment and human health – Case studies.

Documentation study of the Human health and the environment in nearby Hospital (Statistical report)

TOTAL: 45 HOURS

REFERENCES:

1. Trivedi.R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi,2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.
5. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006
6. Ravikrishnan“Environmental Science and Engineering” Sri Krishna Hi-tech Publishing Company Pvt
7. https://en.wikipedia.org/wiki/Carbon_capture_and_storage