MECHANICAL ENGINEERING DESIGN

Course Code: 13ME306 **L –T – P: 3-0-2**
Prerequisite: 13ME205 **Credits: 4**

BASICS: Phases of design, General considerations and procedure in machine design, standardization, preferred numbers, Mechanical properties of materials. DESIGN FOR STATIC STRENGTH: Simple Stresses - Combined stresses - Torsional and Bending stresses - Factor of safety and theories of failure. DESIGN FOR FATIGUE STRENGTH: Stress concentration – Methods of reducing stress concentration factor, Design for f luctuating stresses, Fatigue strength and Endurance limit, Goodman diagram and Soderberg methods for combination of stresses, applications of soderberg's equation. DESIGN OF SHAFTS AND COUPLINGS: Shaft and its design based on strength, Design of shaft for variable load and based on stiffness. Introduction, types, uses, Design procedures for rigid and flexible rubber-bushed couplings. POWER SCREWS: Types - Mechanics of power screws, efficiency, Design of Bolted joints (along with eccentric loading), WELDED JOINTS: Design of Welded joints, Strength of welded joints, Welded joint with eccentric loading. DESIGN OF SPRINGS: Types, Design of Helical spring against static and fluctuating loads, Torsion springs, Spiral springs, Leaf springs. FLYWHEEL: Torque analysis, Solid disc flywheel, rimmed flywheel, stresses in rimmed flywheel.

TEXT BOOKS:

1. Shigley J.E, "Mechanical Engineering Design", McGraw-Hill, 1996.
2. Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Ltd

REFERENCE BOOKS:

1. Budynas, R. G., & Nisbett, J. K. Shigley's mechanical engineering design: McGraw-Hill.
2. Norton, R. L. Machine design: an integrated approach: Prentice Hall
3. Spotts, M. F., Shoup, T. E., & Hornberger, L. E. Design of machine elements : Pearson /Prentice Hall
4. Hamrock,B.J. et.al., Fundamentals of Machine Elements, McGraw Hill
5. Design of machine elements by Bhandari, Tata McGraw Hill book Co.
6. Machine Design by Dr.N.C.Pandya & Dr. C.S.Shah, Charotar Publishing House

"Usage of: "Design Data", P.S.G. College of Technology, Coimbatore is recommended".

METROLOGY AND INSTRUMENTATION

Course Code:13ME304 **L –T – P: 3-0-2**
Prerequisite: 13ES102 **Credits: 4**

Basic Concepts- Measurement system elements, Experimental Test Plan- Random Tests, Replication & repetition, Calibration - Sensitivity, Range, Accuracy, Standards, Traceability. Signals - Types of waveforms, Signal analysis, Signal amplitude & frequency, Fourier transform, Frequency spectrum. Measurement Systems Modelling- General model, First order systems, Second order systems, Transfer functions. Statistical Measurement theory- Confidence intervals for means and standard deviations, Regression analysis, Data outlier detection. Uncertainty analysis- Type A and Type B, Determining combined standard uncertainty- Uncorrelated and correlated input quantities, reporting. Sampling concepts, Digital devices, D/A & A/D conversion, Data acquisition systems. Metrology: Interferometry-, Slip gauges, Comparators, Abbe's principle, Pneumatic transducer, Electronic transducers, Angle measurement- Sine bar, angle gauges Optical instruments- Profile projectors, Autocollimators. Surface finish- Parameters, Stylus instruments. Limits and fits, Tolerancing of gauges, Evaluation of geometric tolerances, Screw thread measurements, Gear measurements. Coordinate Measuring Machines- Construction, Operation & Programming, Software, Applications. Machine Vision. Instrumentation: Temperature measurement- Expansion thermometers, Resistance Temperature Detectors, Thermistors, Thermocouples, radiative measurements. Pressure measurements- Manometers, Elastic transducers. Strain measurements- Resistance & semiconductor strain gauges, circuits and arrangements. Force & Torque measurements.

Text Books:

1. Figliola, Richard S, & Beasley, Donald E, "Theory and Design for Mechanical Measurements", Third edition, John Wiley & Sons Inc,
2. Collett, CV, & Hope, AD, "Engineering Measurements", Second edition, ELBS/Longman.

References:

1. Chapman, W. A. J., "Workshop Technology - Part 3" Oxford & IBH Publishing Co Pvt Ltd, New Delhi.
2. Doebelin, Ernest O., "Measurement Systems", 4th edition, McGraw-Hill International.
3. Montgomery, Douglas C., "Design and Analysis of Experiments", Fifth ed, John Wiley & Sons Inc. New Delhi.
4. Taylor, B. N., and Kuyatt, C. E.,"NIST Technical Note 1297: Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results", National Institute of Standards and Technology, USA.

HEAT TRANSFER

Course Code:13ME401 **L –T – P: 3-0-2**
Prerequisite: 13ES201 **Credits: 4**

Introduction: Modes and laws of Heat transfer, thermal conductivity, Fourier rate equation, Steady state Heat conduction, General conduct ion equation in Cartesian, Cylindrical and Spherical coordinates; **One-Dimensional Heat Conduction:** Heat flow through plane wall, cylinder and sphere with constant thermal conductivity, Heat flow through composite slab and cylinders, Thermal resistance, Electrical analogy, Thermal contact resistance, problems on variable thermal conductivity, critical insulation thickness for cylinders and spheres; **Conduction With Internal Heat Generation:** Simple systems with uniform heat generation in slabs, cylinders; **Extended Surfaces:** Types, Applications, Heat transfer from fins with uniform cross section, Fin efficiency and Effectiveness; **Transient Conduction:** Lumped system analysis, time constant, semi infinite body, Heisler Charts; **Principles Of Convection:** Principles of convection, Continuity, Momentum & Energy equations; **Forced Convection**: **End Flows:** Hydrodynamic and thermal boundary layers, boundary layer thickness, use of empirical relations for convective heat transfer over flat plates and cylinders, **Internal Flows:** Fully developed laminar flow, hydrodynamic and thermal entry lengths, Prandtl analogy, Turbulent flow inside tubes, Empirical relations for horizontal pipe flow, Duct flow & annulus flow; **Natural Convection:** Analysis of laminar flow on a vertical plate, Correlations for vertical plates, horizontal plates, vertical and horizontal cylinders; **Heat Exchangers:** Classification and type of heat exchangers, Flow arrangement, Overall heat transfer coefficient, Fouling factor, LMTD method of Heat exchanger analysis, correction, Effectiveness - NTU method; **Radiation:** Introduction, Radiative Properties, concept of black, white and grey body, Laws of radiation, Stefan Boltzman's law; Lamberts cosine law, Kirchhoff's law, Planck's law, Wein's law, **Radiation Heat Exchange Between Two Bodies: Shape factor,** shape factor algebra, Heat Exchange by radiation between two finite parallel surfaces, Electrical analogy, solid angle and Radiation intensity, Heat exchange by radiation between two finite black and gray surfaces, Radiation shields, Error in temperature measurement.

TEXT BOOKS:

1. Heat transfer - Cengel ,Mc Graw Hill
2. Heat Transfer – R.C.Sachdeva, New Age International Publishers Ltd.

REFERENCE BOOKS

1. Heat Transfer - A Basic Approach-- N.Ozisik , Mc Graw Hill
Introduction Heat and Mass Transfer – K Ramakrishna & P K Sarma –John Wiley

ADVANCED EMPLOYABILITY SKILLS

COURSE CODE : 13AC 301 **L – T – P: 1-0-2**
PRE-REQUISITE: 13AC202 **CREDITS: NIL**

Competency 1: Industry recommended schemes of reporting during the Practice School

- Practice School: The Concept, Advantages
- Practice School:: requirements-KSA
- Practice School:: Data Management
- Practice School:: Reports to be maintained Weekly, Monthly, Interim and Final
- Practice School:: Reports to be maintained Weekly, Monthly, Interim and Final

Competency 2: Professional behaviors at workplace.

- Assertiveness Development - 1
- Assertiveness Development - 2
- Assertiveness Development : Communicating With Difficult People
- Self Motivation Techniques
- Taking Up Responsibility
- Sense of Ownership

Intra Personal Skills **Competency 3:** Leadership qualities in a business context

- Interpersonal Skills
- Negotiation and Persuasion Skills - 1
- Negotiation and Persuasion Skills - 2
- Time Management-1
- Time Management-2

Competency 4: Achieving Organizational and Personal goals through collaboration and innovation

- Workplace Collaboration & Workplace Communication - 1
- Workplace Collaboration & Workplace Communication - 2
- Personal Goal Setting - 1
- Personal Goal Setting - 2
- Creativity & Innovation - 1
- Creativity & Innovation - 2

Competency 5: Development of leadership and emotional stability in stressful business contexts.

- Emotional Intelligence - 1
- Emotional Intelligence - 2
- Personal Organization and Productivity - 1
- Personal Organization and Productivity - 2
- Conflict resolution - 1
- Conflict resolution - 2
- Stress Management

LAB: EES-II

Session No Topic

1 Review of the Previous Semester Objectives

2 Industry watch : Student Interest In Practice School Sector
3 Assertiveness Development : Case Study and Role Plays
4 Industry Watch : Core Industry:
5 How to Show Professional Responsibility: Case Study Presentation
6 Industry Watch : Core Industry:
7 Inter Personal and Intra Personal Skills: Activity
8 Industry Watch: Core Industry: Practice School
9 Negotiation Skills: Activity
10 Industry Watch: Allied Industries: Opportunities
11 Telephone Interviews: Mock Practice(phone required in the Lab) :
12 Goal Setting: Success Story Case Study and Practice
13 Conflict Resolution: CCC Cases, Gender Cases, Ego Cases
14 TEST BUFFER
15 TEST BUFFER

REFERENCE BOOKS: For Essentials of Employability Skills I and II:

- Business Communication: Bovee and Phill by Pearson
- Business Communication Strategies by M Monipalli
- Business Communication by Raymond Lesikar
- English for technical communication by Aruna Koneru
- Soft Skills for managers by Dr.Kalyan Chakravarthy and Latha
- Awaken the Giant Within: Tony Robbins
- How to Win Friends and Influence People: Dale Carnegie
- Richest Man in Babylon: George Clason
- Change Your Thoughts, Change Your Life: Wayne Dyer
- Money and the Law of Attraction: Esther Hicks
- A New Earth: Echart Tolle
- How To Actively Take Control of Your Time and Your Life
- How to Create Your Personal Development Plan
- How To Get Motivated
- Never Check Email First Thing In The Morning
- Covey's Time Management Matrix (Illustrated with Comics)
- Famous Failures - Michael Jordan, Abraham Lincoln and J.K. Rowling
- Writing Down Your Goals - The Harvard Written Goal Study
- Will Power: How To Improve Your Personal Self Discipline
- The Definitive Guide to Organize Your Life And Get Rid of Clutter
- Rules For Living Your Best Life
- How To Stop Wasting Time Online
- Think and Grow Rich: Naopleon Hill
- Science of Getting Rich: Wallace D Wattles
- One Minute Millionaire: Jack Canfield and Mark Victor Hansen
- Getting Things Done: David Allen
- Seven Habits of highly Effective People: Covey
- Manage Your Self: Jagdis Parekh
- You Can win: Shiv Khera
- Soft Skills: gurumurthy
- Soft Skills: Meenakshi Raman

Professional Elective- 1

AUTOMOBILE ENGINEERING

COURSE CODE: 13ME-335 **L – T – P: 3-0-0**
PRE-REQUISITE: NIL **CREDITS: 3**

Introduction to Automobiles: Classification of vehicles – applications, options of prime movers, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles. **Engine:** Engine Classification, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, pistons, piston rings, Firing order; Crankshafts, Flywheel. Fuel Supply systems for Petrol Engines, Fuel pumps. Mechanical and Electrical Diaphragm pumps, Carburetors, Electronic petrol injection**. Ignition Systems:** Energy requirement for ignition**,** Battery ignition system, Magneto ignition, modern systems, firing order, timing and engine parameters, **Cooling Systems:** Coolants, properties, Air and water cooling systems. **Lubrication System:** Lubricants, Properties, Splash, semi-pressure and full pressure Lubricating systems. **Chassis:** Components of an automobile, Layout, Specifications, Articulated and rigid vehicles, Front wheel drive, rear wheel drive, 4- wheel drive, frame, types, aerodynamic considerations, energy absorbing bumpers. **Emission:** Emission from automobiles-pollution standards, national and international-pollution control techniques. **Transmission:** Clutches: single and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms, Gear Box - Four speed and Five Speed Sliding Mesh, Constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working. **Suspension:** systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment.
Vehicle Control: steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic).
Electronic systems: Typical engine management systems, position displacement and speed sensing, measurement of pressure, temperature and intake air flow, exhaust oxygen sensor.

TEXT BOOKS:

1. Automotive Mechanics – Crouse / Anglin, TMH.
2. Automotive Mechanics, Principles & Practices – Joseph Heitner, EWP.

REFERENCE BOOKS:

1. Motor Automotive Technology by Anthony E. Schwaller – Delmer Publishers, Inc.
2. The Motor Vehicle – Newton steeds Garrett, Butter Worths.

MECHATRONICS SYSTEMS AND CONTROL

COURSE CODE: 13ME355 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME109 **CREDITS: 3**

Time response design: Routh-Hurwitz test, relative stability, Root locus design, construction of root loci, phase lead and phase-lag design, lag-lead design.

Frequency response design: Bode, polar, Nyquist, Nichols plot, lag, lead, lag-lead compensator,
time delay, process plant response curve. PID controller design.

Modern control: Concept of states, state space model, different form, controllability, observability; pole placement by state feedback, observer design, Lunenburg observer, reduced order observer, observer based control.

Optimal control design: Solution-time criterion, control-area criterion, performance indices; zero steady state step error systems; modern control performance index: quadratic performance index, Ricatti equation.

Digital control: Sampling process, sample and hold, analog to digital converter, use of z-transform for closed loop transient response, stability analysis using bilinear transform and Jury method, digital control design using state feedback.

Non-Linear Control System: Common physical non-linear system, phase plane method, system analysis by phase plane method, stability of non-linear system, stability analysis by describing function method, Liapunov's stability criterion, Popov's stability criterion.

Text Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall India (2002).
2. Gene F. Franklin, J. D. Powell, A E Naeini, "Feedback Control of Dynamic Systems", Pearson (2008).
3. John Van De Vegte, "Feedback Control Systems", Prentice Hall (1993).
4. Thomas Kailath, "Linear Systems", Prentice Hall (1980).
5. Alok Sinha, "Linear Systems: Optimal and Robust Control", Taylor & Francis
6. Brian D. O. Anderson and John B. Moore, "Optimal Control: Linear Quadratic Methods", Dover Publications (2007).
7. K. Ogata, "Discrete-Time Control Systems", PHI Learning (2009).
8. H.K. Khalil, "Nonlinear Systems", Prentice Hall (2001).

FLEXIBLE MANUFACTURING SYSTEMS

COURSE CODE: 13 ME365 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME-204 **CREDITS: 3**

Automation: Types of automation, Automated assembly systems, Group Technology, Flexible Manufacturing Systems: Components of an FMS, Robotic technology, Robot programming: Types of programming, lead through programming, Robot applications: Characteristics of robot applications, robot cell design, types of robot applications: Material handling, processing operations, assembly and inspection.

Text Books:

1. Automation, Production Systems and Computer Integrated Manufacturing. Groover M.P, Prentice Hall of India.
2. CAD/CAM – Groover M.P, Zimmers E.W, Prentice Hall of India.

Reference Books:

1. Approach to Computer Integrated Design and Manufacturing Nanua Singh, John Wiley and Sons, 1998.
2. Production Management Systems: A CIM Perspective Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.

R & AC

COURSE CODE: 13ME-331 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME-202 **CREDITS: 3**

Introduction to Refrigeration: Necessity and applications, unit of refrigeration and COP, methods of refrigeration; **Air Refrigeration:** Reversed Carnot Cycle, Bell Coleman cycle, Advantages and disadvantages of air refrigeration, Open and Dense air systems, Actual air craft refrigeration system, different types; **Refrigerants:** Nomenclature, Desirable properties, common refrigerants used, Eco friendly refrigerants, ODP; **Vapour Compression Refrigeration:** Working principle, essential components of plant, simple vapour compression refrigeration cycle, Effect of condenser pressure, evaporator pressure, sub cooling and super heating. Multi pressure systems – multistage compression, multi evaporator system, use of p–h charts; **System Components:** Compressors**-**general classification, comparison, advantages and disadvantages, Condensers classification and working, Expansion devices-classification and working, Evaporators-classification and working; **Vapour Absorption System:** Calculation of max COP, description and working of NH_3 - water system, Li - Br, H_2O system, principle of operation of three fluid absorption system and salient features problems; **Production of Low Temperature:** Cascade system, Production of Solid CO_2; **Steam Jet Refrigeration System:** Principle of working, application, merits and demerits. **Introduction to Air Conditioning:** Psychrometric properties and processes, sensible and latent heat loads, SHF, need for ventilation, infiltration, concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning and requirements, air conditioning load calculations; **Air Conditioning Systems:** classification, concepts of RSHF, ASHF, ESHF & ADP, filters, grills and registers, deodorants, fans and blowers.

TEXT BOOKS:

1. Refrigeration and Air conditioning by Stoecker & Jones.
2. Jordon and Priester, “Refrigeration and Air Conditioning”, Prentice Hall of India Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. Principles of Refrigeration by Dossat. , Thomas J. Horan: Books.
2. Refrigeration and Air conditioning by C.P. Arora.
3. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
4. Heating, Ventilating, Air-Conditioning and Refrigeration by Billy C. Langley, Prentice Hall

COMPUTER AIDED DESIGN

COURSE CODE: 13ME-345 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME-205 **CREDITS: 3**

INTRODUCTION: Fundamentals of CAD, Design process, Applications of computer for design, Benefits of CAD, Computer peripherals for CAD work station, Graphic terminal, CAD software, CAD database and structure.

DISPLAY DEVICES: Video display devices – Raster scan display, CRT , DVST,Inherent memory display devices, Random Scan Display, Raster scan systems – Video controller, Random scan systems – Graphic monitors and work station, Input devices.

PRIMITIVES: Points and Lines, Line drawing algorithms, DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Mid point circle algorithm.

GEOMETRIC MODELING: 2D wire frame modeling, 3D Wire frame modeling, Wire frame models ,
Entities and their definitions. Concept of Parametric and nonparametric representation of curve, Curve fitting techniques, Definitions of cubic splines.

SURFACE MODELING: Surface modeling and entities, Algebraic and geometric form, Parametric
space of Surface, Blending functions, Reparametrisation of surface patch, Sub dividing cylindrical surface, Ruled surface, Surface of revolution, Spherical surface, Composite surface.

SOLID MODELING: Solid models, Solid entities, Solid representation, Sweep representation, Constructive solid geometry and Boundary representation, Solid modeling based applications.

GEOMETRIC TRANSFORMATIONS: Transformation Principles, Translation,Scaling, Rotation, Matrix
Representations and Homogeneous Coordinates, Composite transformations and other transformations

WINDOWS and CLIPPING: Introduction, The Viewing Transformation, Viewing transformation implementation, Clipping operation.

TEXT BOOKS:

1. CAD/CAM by Mikel P.Groover and Emory W.Zimmers,Prentice Hall of India , Delhi
2. CAD/CAM by P.N.Rao, Tata McGrawhill , Delhi
3. CAD by Ibrahim Zeid, Tata McGrawhill,Delhi.
Principles of Interactive Computer Graphics by Newman and Sproull, McGrawhill

MODELING & SIMULATION OF MECHATRONIC SYSTEMS

COURSE CODE: 13ME357 **L – T – P: 3-0-0**
PRE-REQUISITE: NIL **CREDITS: 3**

Physical Modelling: Mechanical and electrical systems, physical laws, continuity equations, compatibility equations, system engineering concept, system modelling with structured analysis, modelling paradigms for mechatronic system, block diagrams, mathematical models, systems of differential-algebraic equations, response analysis of electrical systems, thermal systems, fluid systems, mechanical rotational system, electrical-mechanical coupling.

Simulation Techniques: Solution of model equations and their interpretation, zeroth, first and second order system, solution of 2nd order electro-mechanical equation by finite element method, transfer function and frequency response, non-parametric methods, transient, correlation, frequency, Fourier and spectra analysis, design of identification experiments, choice of model structure, scaling, numeric methods, validation, methods of lumped element simulation, modelling of sensors and actuators, hardware in the loop simulation (HIL), rapid controller prototyping, coupling of simulation tools, simulation of systems in software (MATLAB, LabVIEW) environment.

Modelling and Simulation of Practical Problems:

- Pure mechanical models
- Models for electromagnetic actuators including the electrical drivers
- Models for DC-engines with different closed loop controllers using operational amplifiers
- Models for transistor amplifiers
- Models for vehicle system

Text Books:

1. L. Ljung, T. Glad, “Modeling of Dynamical Systems”, Prentice Hall Inc. (1994).
2. D.C. Karnopp, D.L. Margolis and R.C. Rosenberg, “System Dynamics: A Unified Approach”, 2nd Edition, Wiley-Interscience (1990).
3. G. Gordon, “System Simulation”, 2nd Edition, PHI Learning (2009). V.
4. Giurgiutiu and S. E. Lyshevski, “Micromechatronics, Modeling, Analysis, and Design with MATLAB”, 2nd Edition, CRC Press (2009).

COMPUTATIONAL FLUID DYNAMICS

COURSE CODE: 13ME-337 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME-201 **CREDITS: 3**

Introduction: Conservation equation; mass; momentum and energy equations; convective forms of the equations and general description; **Classification and Overview of Numerical Methods:** Classification into various types of equation; parabolic elliptic and hyperbolic; boundary and initial conditions; over view of numerical methods; **Finite Difference Technique:** Finite difference and volume methods; Taylor series expansion; boundary layer treatment; **Methods of Solution:** Solution of finite difference equations; iterative methods; matrix inversion methods; ADI method; operator splitting; fast Fourier transform; **Time integration Methods:** Single and multilevel methods; Applications to transient conduction and advection-diffusion problems; **Numerical Grid Generation:** Numerical grid generation; basic ideas; transformation and mapping; **Navier-Stokes equations:** Explicit and implicit methods; SIMPLE type methods; fractional step methods; **Turbulence modeling:** Reynolds averaged Navier-Stokes equations, RANS modeling, DNS and LES. S**oftware Package**: ANSYS 13(Fluent/CFX)

TEXT BOOKS:

1. Numerical Computation of Internal and External Flows, C. Hirsch, Vols. I & II, John Wiley & Sons (2004)

2. An Introduction to Computational Fluid Dynamics, H. K. Versteeg & W. Malalasekera, Longman Scientific & Technical (1995)

REFERENCE BOOKS:

1. Computational Fluid Mechanics and Heat Transfer, J. C. Anderson, D. A. Tannehil and R. H. Pletcher, Taylor & Francis publications, USA (1997)

Fundamentals of CFD, T. K. Sengupta, Universities Press (2004)

MODERN MANUFACTURING PROCESSES

COURSE CODE: 13ME366 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME204 **CREDITS: 3**

Introduction, Need For Non Traditional Machining Methods, Classification of Modern Machining Processes, Considerations in process selection, materials and applications, Mechanical Energy Based Processes, Chemical Energy Based Processes, Electro – Chemical Energy Based Processes, Thermo Electric Energy Based Processes, Advanced Welding Techniques, High Velocity Forming process. Introduction, Selection, Comparison Of Conventional, Explosion Forming Process, Electro Hydraulic Forming, Magnetic Pulse Forming, Petro Forge Hammer.

Text Books:

1. Advanced machining processes / Jain V K / Allied Publishers, 2005
2. Welding and Welding Technology, Richard L. Little, McGraw Hill.Inc., U S,Ist Edition.

Reference Books:

1. Modern Machining Processes / Pandey P.C. and Shah H.S./ TMH, 1995
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984
3. Production Technology -- H.M.T.
4. High velocity forming of metals -ASTME Prentice Hall
Non Conventional Machining by P K Mishra, Narosa Publications

ADVANCED STRENGTH OF MATERIALS

COURSE CODE: 13 ME 341 **L – T – P: 3-0-0**
PRE-REQUISITE: 13ME-205 **CREDITS: 3**

STATICALLY INDETERMINATE BEAMS: Statically indeterminate Beams, Analysis by the differential equations of the Deflection curve, Moment Area Method.
CONTINUOUS BEAMS: Clapeyron's theorem of three moments, Beams with constant and varying moments of inertia.
CURVED BEAMS: Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross-sections.
Unsymmetrical Bending: Shear Center, Examples of unsymmetrical bending, Simple problems on shear center.
CENTRIFUGAL STRESSES: Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform Strength.
Thick pressure vessels: Thick Cylinders: Lame's theory, Radial Deflection, Compound Cylinder.
ENERGY METHODS: Introduction, Principles of virtual work, unit load, Method for calculating displacements, Strain energy & complementary energy, Strain Energy Methods

Text books:

1. Mechanics of Materials by Gere and Timoshenko, CBS publishers, 2nd edition.

Reference Books:

1. Pytel A H and Singer F L, "Strength of Materials", Harper Collins, New Delhi.

2. Beer P F and Johston (Jr) E R, "Mechanics of Materials", SI Version, McGraw Hill, NY.

3. Popov E P, "Engineering Mechanics of Solids", SI Version, Prentice Hall, New Delhi.

4. Advanced Mechanics Of Solids by L. S. Srinath, 3rd edition Tata McGraw-Hill, 2009.