COURSE SCHEME
EXAMINATION SCHEME &
COURSE CONTENTS
OF
I-II SEMESTER CBCS OF

MASTER OF TECHNOLOGY (M.TECH.)
IN
MECHANICAL ENGINEERING DESIGN (MED)
OF
GONDWANA UNIVERSITY,
GADCHIROLI
# GONDWANA UNIVERSITY, GADCHIROLI

## FACULTY OF ENGINEERING AND TECHNOLOGY

Course and Examination Scheme for

Master of Technology in - Mechanical Engineering Design (MED)

### SEMESTER - I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of Course</th>
<th>Teaching scheme</th>
<th>Examination Scheme</th>
<th>Practical</th>
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<td>Computer Aided Mechanical Design</td>
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<td>Lab. Practice-I (Mechanical Vibration)</td>
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**Elective–I (MED15)**:  
(A) Advance Engineering Materials  
(B) Design for Manufacturing & Assembly  
(C) Reliability, maintainability & wear
# Course and Examination Scheme for Master of Technology in - Mechanical Engineering Design (MED)

## SEMESTER- II

<table>
<thead>
<tr>
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<th>Teaching scheme</th>
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<td>MED 21</td>
<td>Analysis &amp; Synthesis of Mechanisms</td>
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<td>MED 22</td>
<td>Finite Element Analysis</td>
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<td>MED 23</td>
<td>Optimization Techniques in Design</td>
<td>3</td>
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<td>Lab. Practice-II (FEA)</td>
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<td>Seminar-II / Mini Project</td>
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- **Elective–II (MED 24)**: (A) Tribology & Bearing Design  (B) Design of hydraulic & Pneumatic Systems  (C) Design of Mechanical Handling System
- **Elective–III (MED 25)**: (A) Advanced Machine Tool Design  (B) Robotics & Automation  (C) Fracture Mechanics
FIRST SEMESTER

M.TECH. – MECHANICAL ENGINEERING DESIGN (MED)

M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 11- ADVANCED ENGINEERING MATHEMATICS

CREDITS: 04

Teaching Scheme:                                      Examination Scheme
Lectures: 03 Hrs. /Week                               Duration of paper: 03 Hrs.
Tutorials: 01 Hr. /Week                               University Assessment: 70 Marks
                                                        College Assessment: 30 Marks

CONTENTS:


Numerical solutions to the partial differential equations: Finite difference equivalence to partial derivatives, elliptical, parabolic and hyperbolic equations.

Curve Fitting: Least square curve fitting procedures for straight line, Nonlinear curve fitting, weighted least square approximation, Method of least square for continuous function.

REFERENCES

2. Chandrika Prasad “Advanced Mathematics for Engineers”, Prasad Mudranalaya, New Edition,
5. Linear Algebra, Jin Ho Kwak and Sungpyo Hong, Springer international edition
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 12- ADVANCED MECHANICS OF SOLIDS

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:

Shear Centre: Bending axis and shear center-shear center for axis-symmetric and unsymmetrical sections. Unsymmetrical bending: Bending stresses in Beams subjected to Non symmetrical bending; Deflection of straight beams due to non symmetrical bending.

Torsion: Torsion of a cylindrical bar of Circular cross Section; Saint-Venant’s semi-inverse methods; Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hallow thin wall torsion members, Multiply connected Cross section, Thin wall torsion members with restrained ends.

Theory of Plates: Introduction; Stress resultants in a flat plate; Kinematics: Strain-Displacement relations for plates; Equilibrium equations for small displacement theory of flat plates; Stress-Strain-Temperature relation for Isotropic plates: Strain energy of a plate; Boundary conditions for plate; Solution of rectangular plate problem; Solution of circular plate problem. General theory Beams on Elastic Foundation.

Contact Stresses: Introduction, problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Methods of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact).

REFERENCES:

1. Advanced Mechanics of materials/Seely and Smith/ John Willey
2. Advanced Mechanics of materials / Boresi & Sidebottom/Wiley international
3. Advanced strength of materials / Den Hortog J.P./Torrent
4. Theory of Plates /Timoshenko/
5. Strength of materials / Sadhu singh/ Khanna Publishers
CONTENTS:

Vibration problems in engineering causes and effects of vibration relevance of vibration analysis continuum and discrete modelling lumped parameter systems free vibration and response to damped single degree freedom systems. Frequency response function-amplitude and phase plots mechanical impedance and mobility – vibration isolation.


REFERENCE:

5. Timoshenko, Engineering vibration.
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 14 - COMPUTER AIDED MECHANICAL DESIGN

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:


CAD of Machine Elements: Development of interactive design programs [with drafting] for machine elements, incorporating choice of materials and other parameters, Generation of several alternate designs and evaluation.

Geometric Modeling: Mathematical representation of Hermite cubic, Bezier & B-spline curves. Introduction to difference type of surfaces and solids generated in surface and solid model respectively. Assembly modeling and interference checking.

REFERENCE:
M.Tech. – Mechanical Engineering Design (MED)

ELECTIVE - I

COURSE: MED 15A- ADVANCED ENGINEERING MATERIALS

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:

Introduction to Engineering Materials: Classification of Engineering materials, Material selection in mechanical design, Engineering materials and their properties, Basics of materials selection, the design process, material selection charts, Materials-process selection charts. A material selection criterion for flywheels, elastic hinges, springs, materials for passive solar heating

Ferrous Materials: Introduction to Fe-Fe3C phase equilibrium diagrams with relevant reactions, suitable heat treatment and application, stainless steel, heat resisting steels, high temperature alloys for power plant and nuclear applications, precipitation hardenable steels, HSLA steels, micro-alloyed steels, ball bearing steel, high nitrogen steels, cast iron, alloy cast iron, special types of tool steels

Non-ferrous materials: Mechanical properties, phase diagrams, heat treatment and applications: Copper and copper alloys, Aluminium and aluminium alloy (Al-Mg-Si, Al-Cu, Al-Si, Modified form of Al-Si or LM series alloys), designated system in Al-alloys, materials

Special Materials: High entropy materials with composition, ternary phase diagrams and applications, Materials for bio-compatibility, Application of reactive materials like Molybdenum, Niobium and Magnesium alloys, Materials for high temperature wear application


Organic materials: Classification, properties, application of polymers, plastics and elastomers.

Ceramic materials: Classification, properties, structure of refractories, abrasive materials, ceramics for electronic application, cement and concrete.
REFERENCES:

5. Rajput R. K., Materials Science and Engineering, Kataria and sons.
7. Michael Ashby, Design & Selection of Materials
M.Tech. – Mechanical Engineering Design (MED)

ELECTIVE - I

COURSE: MED 15B-DESIGN FOR MANUFACTURING AND ASSEMBLY

CREDITS : 04

Teaching Scheme:
Lectures: 03 Hrs./Week
Tutorials: 01 Hr./Week

Examination Scheme
Duration of paper : 03 Hrs.
University Assessment : 70 Marks
College Assessment: 30 Marks

CONTENTS:


Product design for manual assembly – General guidelines, systematic design for assembly, effect of various design features on manufacturing, design examples.

Design for high speed automatic and robotic assembly – Design for high speed feeding and orientating, High speed inspection, Analysis of assembly, design examples.

Design for machining – Design for single point / multi point / abrasive machining, assembly of components, accuracy and surface finish, cost estimating, design examples.

Design for injection moulding – Injection moulding materials, moulding cycles, estimation of optimum number of cavities, design examples.


Design for forging – characteristics, cost estimation and design rules.

REFERENCE:

M.Tech. – Mechanical Engineering Design (MED)

ELECTIVE - I

COURSE: MED 15C-RELIABILITY, MAINTAINABILITY & WEAR

CREDITS : 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper : 03 Hrs.
University Assessment : 70 Marks
College Assessment: 30 Marks

CONTENTS:
Introduction to reliability availability and maintainability failure distributions, Weibull distribution and its applications to industries.

Design and manufacturing for reliability, reliability assessment of mechanical systems FMES and FTA techniques.

Monte carlo simulation method, markov chains in reliability. Maintenance policies and philosophies conditions based antennae, Vibration monitoring non destruction testing.


REFERENCES:

2. Reliability Methods Engineering and its application – G.P. Chhalotra –Khanna
5. Reliability Engineering –D.J. Smith- Pitman Publishing
7. Mechanical Reliability – A.D.S. Carter- Mc Millan
10. Thomson A. Reliability Based Mechanical Design
11. Hull B. , Jhon V. , Non Destructive testing.
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 16- LAB 1 – MECHANICAL VIBRATIONS

CREDITS: 01

Teaching Scheme:
Practicals: 02 Hrs. /Week

Examination Scheme
University Assessment: 25 Marks
College Assessment: 25 Marks

List of Experiments
Term work shall consists of the following
1. Simulation study using mathematical simulation software or any programming language on
   a. Single DOF system
   b. Multi DOF system
2. Simulation study of the followings on any simulation platform
   a. Modal analysis
   b. Transient analysis
   c. Harmonic analysis
   d. Active vibration control
3. Experimentation
   a. Acquiring time domain vibration data by using sensors (displacement / velocity / acceleration)
   b. Demonstration of condition based maintenance tool using vibration techniques
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 17- SEMINAR-I

CREDITS : 01

Teaching Scheme:
Tutorials: 02 Hrs./Week

Examination Scheme
University Assessment : -------
College Assessment : 50 Marks

CONTENTS:

Seminar shall consists of the in depth study of a topic, related to the field of Design engineering and should have research orientation. The student should know recent developments and applications in the chosen field of study. The topic of study/research is mutually decided by the student and the supervisor and a detailed technical report will be prepared, report shall consist of about 20-25 pages of ‘A4’ size sheets in either comb or hard bound.

The candidate will have to deliver a seminar presentation in front of the examiners, one of them will be guide and other will be the examiner appointed by University. The performance of the student will be evaluated by both examiners jointly based on the content of the seminar, delivery of seminar and answers to the queries of the examiners.
SECOND SEMESTER

M.TECH. –

MECHANICAL

ENGINEERING

DESIGN (MED)
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 21: ANALYSIS AND SYNTHESIS OF MECHANISMS

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:

Basic concepts related to kinematic analysis of mechanisms, degree of freedom, Grashoff’s and Grubler’s criteria, Transmission and deviation angles, mechanical advantage. Review of graphical and analytical methods of velocity and acceleration analysis of simple and complex mechanisms.

Curvature theory - Fixed and moving centrodes, inflection circle, Euler-Savary equation, Bobillier constructions, cubic of stationary curvature, Ball’s point, applications in dwell mechanisms.

Synthesis of Planar Mechanisms - Types, number and dimensional synthesis, function generation, path generation and rigid body guidance problems, accuracy(precision)points, Chebychev spacing, types of errors, graphical synthesis for function generation and rigid body guidance using Relative pole method & Inversion method, center point and circle point curves, Bermester points, branch and order defects, synthesis for path generation.

Analytical synthesis of Planar Mechanisms- Freudenstein’s equation, synthesis for four accuracy points, compatibility condition, Introduction to complex numbers method of synthesis, the dyad, center point and circle point circles, ground pivot specifications, three accuracy point synthesis using dyad method, Robert Chebychev theorem, Cognate linkages.

Introduction to Kinematics of Spatial Mechanisms.

REFERENCES:

M.Tech. – Mechanical Engineering Design (MED)
COURSE: MED 22: FINITE ELEMENT ANALYSIS

CREDITS : 04
Teaching Scheme :
Lectures: 03 Hrs./Week
Tutorial : 01 Hrs./Week

Examination Scheme
Duration of paper : 03 Hrs.
University Assessment : 70 Marks
College Assessment : 30 Marks

CONTENTS:
Introduction to Engineering Analysis tool FEA and its application in Linear static Analysis and
2D problems, Study of Finite Element modeling and simulation Techniques, Use of FEA in
structural vibration and thermal Analysis, Basics of FEM – Review of finite difference method,
Initial value and boundary value problems Solution of Boundary Value problems: - weighted
residual, Galerkin and Raleigh Ritz methods,Variational Method, Least square Methods.
Introduction to meshless FEM, FEA and Linking mechanical design with FEA
Element Matrices: Direct stiffness Method, Properties of global stiffness Matrix, Analysis of
simply supported beam
Two Dimensional Elements: Linear Triangular Elements, Rectangular Elements, Two
Dimensional Field equations: Coordinate Systems, Isoparametric elements and numerical
integration, Integral equations for the element Matrices, Heat transfer by conduction: One
dimensional fins, two dimensional fins, and Long and convection Two Dimensional bodies.
FE Applications in Solid Mechanics: The axial force members, potential energy formulations. The
Truss Element, Beam element, plane frame element, modeling of bolts for assembly, 3D problems
Two dimensional Elasticity: The displacement functions, Element matrices, Element Shape
Functions: Evaluating shape functions
FEM Computations Solution Methods FEM Modeling and Preprocessing FEM Hardware and Post
processing Survey of some FE Software Systems

REFERENCES:
3. Desai, Chandrakant S., and John Fredrick Abel. Introduction to the finite element method;
4. Zienkiewicz, Olek C., and Robert L. Taylor. The finite element method: Its basis and
fundamentals.
5. K.J. Bathe, Finite Element Procedures, Klaus-Jurgen Bathe
Sons
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 23: OPTIMIZATION TECHNIQUES IN DESIGN

CREDITS: 04

Teaching Scheme:
- Lectures: 03 Hrs. /Week
- Tutorial: 01 Hrs. /Week

Examination Scheme
- Duration of paper: 03 Hrs.
- University Assessment: 70 Marks
- College Assessment: 30 Marks

CONTENTS:

Introduction, methods, engineering applications of optimization, Statement of an Optimization Problem and Classification of Optimization Problems.


Linear Programming: Simplex Methods, Sensitivity Analysis, Transportation Problem.

Integer Programming: Graphical Representation, Integer Polynomial Programming.

Geometric Programming: Formulation and Solutions of Unconstrained and Constrained geometric programming problem.

Dynamic Programming: Multistage Decision Processes.


Unconstrained Optimization Techniques: Univariate, Conjugate Gradient Method and Variable Metric Method.

Constrained Optimization Techniques: Characteristics of a constrained problem; Direct Method of feasible directions; Indirect Method of interior and exterior penalty functions.

REFERENCES:

ELECTIVE-II

M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 24A: TRIBOLOGY & BEARING DESIGN

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs./Week
Tutorials: 01 Hr./Week

Examination Scheme
Duration of paper : 03 Hrs.
University Assessment : 70 Marks
College Assessment: 30 Marks

CONTENTS:
Introduction to Tribology: Introduction, Friction, Wear, Wear Characterization, Regimes of lubrication, Classification of contacts, lubrication theories, tribological properties of bearing materials and lubricants, theories of friction and wear, instabilities and stick-slip motion.

Newton's Law of viscous forces, Flow through stationary parallel plates. Hagen's Poiseuille's theory, viscometers, Concept of lightly loaded bearings, Petroff's equation, Numerical problems. finite bearings - hydrostatic, hydrodynamic and thrust oil bearings, heat in bearings Hydrostatic squeeze film Circular and rectangular flat plates, variable and alternating loads, piston pin lubrications, application to journal bearings.

Elasto-hydrodynamic lubrication Pressure-viscosity term in Reynold’s equation, hertz theory, Ertel-Grubin equation, lubrication of spheres Air lubricated bearings Tilting pad bearings, hydrostatic, hydrodynamic and thrust bearings with air lubrication Tribological aspects of rolling motion Mechanics of tire-road interaction, road grip and rolling resistance.

REFERENCES:
8. F. M. Stansfield, Hydrostatic bearings for machine tools and similar applications, Machinery Publishing, 1970
10. Tribology in Machine Design, T. A. Stolarski
Elective-II

**M.Tech. – Mechanical Engineering Design (MED)**

**COURSE: MED 24(B) : DESIGN OF HYDRAULIC & PNEUMATIC SYSTEMS**

**CREDITS: 04**

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<td>University Assessment: 70 Marks</td>
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**CONTENTS:**

**I Oil Hydraulic Systems:** Hydraulic Power Generator, selection and specification of pumps, pump characteristics.

**II Hydraulic Actuators:** Linear & Rotary Actuators, Selection, Specification and characteristics.

**III Control & Regulation Elements:** Pressure, direction and flow control valves, relief valves, non return and safety valves actuation systems.

**IV Hydraulic Circuits:** Reciprocating quick return, sequencing synchronizing circuits, accumulator circuits, industrial circuits, press circuits, hydraulic milling machine, grinding, planning copying, forklift earthmover circuits, design and selection of components, safety and emergency modules.

**V Pneumatic System, and Circuits:** Pneumatic fundamentals, control elements, position and pressure sensing, logic circuits, switching circuits, fringe condition modules and their integration, sequential circuits, cascade methods, mapping methods, step counter method, compound circuit design, combination circuit design.

**VI Installation, Maintenance and Special Circuits:** Pneumatic equipments, selection of components, design calculations, application, fault finding, hydro pneumatic automation, robotic circuits.

**REFERENCES:**

Elective-II

**M.Tech. – Mechanical Engineering Design (MED)**

**COURSE:** MED 24(C): Design of Mechanical Handling System

**CREDITS:** 04

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<tr>
<td>Tutorial: 01 Hrs./Week</td>
<td>University Assessment: 70 Marks</td>
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<td>College Assessment: 30 Marks</td>
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</table>

**CONTENTS:**

Constructional features, operation, operational characteristics, advantages, limitations, Design considerations of following conveying machines.

Unit Load conveying: Fork lift Trucks, Trolley, conveyers, Cableways, Rope ways, Cranes, Overhead cranes, Elevators, Drag lines, Robotic Handling, AGV

Bulk solid conveying: Belt conveyers, chain conveyers, Roller conveyers (Gravity & Powered), Screw conveyers, Tubular screw conveyers, Escalators, Vibrating conveyers (Crank type & spring type), Pneumatic conveying.

**REFERENCES:**

1. Aleczandow: —Materials Handlingl, MIR publications
3. Conveyaing Machings by CITADINOV, MIR publications
Elective-III

M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 25(A): ADVANCED MACHINE TOOL DESIGN

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs./Week
Tutorial: 01 Hrs./Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:

REFERENCE:
1. Donaldson, “Tool design”
2. ASTME, “Fundamentals of Tool design”
3. Pollock, “Fundamentals of Tool design”
4. Grant, “Unconventional Clamping Systems”
5. Kempster, “Fundamentals of Tool design”
CONTENTS:
Automation and Robotics: Definition, need of the Robotics, market and future prospects, differentiation of Robots from other automation systems, near relations to robots, robot usages and conditions for its application, Robot Anatomy and Characteristics: Classification, point to point and continuous path system, control loops of robot system, work volume, speed of movement, dynamic performance, Accuracy and repeatability, drive system, sensors used in robotics, letter symbol, coding and kinematics arrangement

Sensors and End Effectors in Robotics: Tactile sensors, proximity and rear sensors, force and torque sensors in Robotics, End effectors: Functions, Types, Design of linkage type end effectors, Vacuum gripper, Magnetic gripper, Special gripper, Engelberger’s principles in selection and design of grippers


CNC Systems And Robotics: Various configurations, CPU, PLC’S, Servo control units, speed position feedback, Other peripheral devices, Tool monitoring controls, Softwares, User interface, PLC programming/DC servo motors, Relays and solenoid stepper motor, Introduction and configuration of the CNC system, Interfacing Monitoring diagnostics, Machine Data, Compensations for machine accuracies, Programming direct numerical control.

Machine Interfacing: Interfacing electro mechanical system to microprocessor, PC and PLC’s, Basic flow charts and programming for controlling machine tools and process parameters with the above systems, Study of various mechanical elements used in CNC: Robotics system vizlinear bearings, ball screws couplings.

REFERENCES:
6. Handbook of Industrial Robotics
ELECTIVE-III

M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 25C: FRACTURE MECHANICS

CREDITS: 04

Teaching Scheme:
Lectures: 03 Hrs. /Week
Tutorials: 01 Hr. /Week

Examination Scheme
Duration of paper: 03 Hrs.
University Assessment: 70 Marks
College Assessment: 30 Marks

CONTENTS:

Fracture mechanics principles: Introduction and historical review, Sources of micro and macro cracks. Modes of fracture failure, Brittle and ductile fracture, NDT and Various NDT methods used in fracture mechanics.

Energy release rate: crack resistance (R curve), stable and unstable crack growth.

Stress intensity factor: Stress and displacement fields, edge cracks, embedded cracks.

Crack tip plasticity: Shape and size of plastic zone, effective crack length, effect of plate thickness, J-Integral. Crack tip opening displacement.

Test methods for determining critical energy release rate, critical stress intensity factor, J-Integral.

Fatigue failure: Crack propagation, effect of an overload, crack closure, variable amplitude fatigue load. Environment-assisted cracking. Dynamic mode crack initiation and growth, various crack detection techniques

REFERENCES:

M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 26: LAB 2 – LAB. PRACTICE-II (FEA)

CREDITS: 01

Teaching Scheme:  
Practicals: 02 Hrs./Week

Examination Scheme
University Assessment : 25 Marks
College Assessment: 25 Marks

List of Experiments
1. Solution of 1D FE problems (Linear Bar) using commercial / freeware / self developed application programs.
2. Solution of 1D FE problems (Quadratic Bar) using commercial / freeware / self developed application programs
3. Solution of Truss problems using commercial / freeware / self developed application programs
4. Solution of 2D FE problems using commercial / freeware / self developed application programs
5. FE Modeling using advanced software

References:
5. K.J. Bathe, Finite Element Procedures, Klaus-Jurgen Bathe
M.Tech. – Mechanical Engineering Design (MED)

COURSE: MED 27- SEMINAR-II / MINI PROJECT

CREDITS: 01

Teaching Scheme: Tutorials: 02 Hrs. /Week

Examination Scheme
University Assessment: --------
College Assessment: 50 Marks

CONTENTS:

Seminar-II :-
Seminar-II shall consists of the in depth study of a topic, related to the field of Design engineering and should have research orientation. The topic may preferably be in continuation with the Seminar – I. The topic of study/research is mutually decided by the student and the supervisor and a detailed technical report will be prepared, report shall consist of about 20-25 pages of ‘A4’ size sheets in either comb or hard bound.
The candidate will have to deliver a seminar presentation in front of the examiners, one of them will be guide and other will be the examiner appointed by University. The performance of the student will be evaluated by both examiners jointly based on the content of the seminar, delivery of seminar and answers to the queries of the examiners.

OR

Mini Project:-
The mini project work extends for a single semester and exposes the student to develop and present his/her work related to specific topic. The work at this stage may involve review of literature, laboratory experimental work, design and fabrication of a mechanical system/model, case study, field data collection and analysis etc. On completion of the mini project work the student shall prepare a report of about 25-30 pages of ‘A4’ size sheets and will deliver a seminar presentation in front of the examiners, one of them will be guide and other will be the examiner appointed by University.