

Programme: Mechanical Engineering

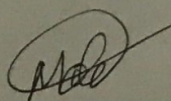
Course: ADVANCED MECHANISM

Course Code: **PGMED101T**

Course Outcomes:

The Student would be able to:

| | |
|------------|--|
| PGMED101.1 | Explain and discuss the concept of kinematic synthesis, class of mechanism and concept of transmission angle (L2, L6) |
| PGMED101.2 | Apply kinematic synthesis to achieve acceptable linkage. Explain various constructions to find radius of curvature, centre of radius of curvature and determine the dimensions of the mechanism (L1, L2, L3, L5) |
| PGMED101.3 | Discuss the approach for optimal synthesis for path generation problem (L6) |
| PGMED101.4 | Discuss Kinematic analysis & synthesis of spatial mechanisms, (L6) |
| PGMED101.5 | Discuss kinematics synthesis of Robot arms, What is forward and reverse Kinematics of serial Robot (L5, L6) |



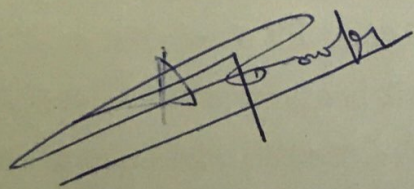
Prof. Syed Mohiuddin
Subject coordinator

Subject Code: - PGMED102T

Subject: - Dynamics of Machinery

Course Outcomes :

| CO | STATEMENT |
|---------|--|
| CO102.1 | Students will be able to understand, analyze and explain the effect of dynamic forces on various links of a mechanism. |
| CO102.2 | Students will be able to do dynamics motion analysis which includes energy distribution method, the rate of change of energy method balancing of linkages by various methods and understand and explain balancing of linkages and flywheel requirement and variation mechanics |
| CO102.3 | Students will be able to understand, explain and determine natural frequency of given system and balancing of rigid rotors. |



Programme : **Mechanical Engineering Design**

Course : Mechanical Vibration

Course Code : PGMED103T

CREDITS : 04

Teaching Scheme Examination Scheme

Lectures: 4 Hours/Week Duration of Paper: 03 Hours University Assessment: 70 Marks College Assessment: 30 Marks

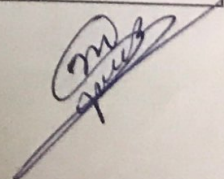
Course Objectives and Expected Outcomes: The study of Vibration is concerned with understanding of cause of vibration in any system also it is concerned with determination of natural frequency for various degrees of freedom. The overall object of this course is to learn, understand meaning of vibration relevant to Mechanical system and Mechanics. It also helps to know Vibration Phenomenon for various continues and discrete system. This course includes various Vibration analysis techniques, Vibration response, longitudinal and transverse Vibration for various structures, Vibration Instrumentation devices, introduction of FFT analyzer and Noise Control techniques.

- 6. Irwin & Garf , industrial Noise & Vibration Control.
- 7. R.A. Collacott, Vibration Monitoring and diagnosis, John Willey, New York, 1979.
- 8. M. Petyt , Introduction to Finite Element Vibration Analysis Cambridge University Press,Cambridge 1990.

COURSE OUTCOME

The students will be able to

| | |
|------|--|
| CO 1 | <i>Define, Classify, Analyze</i> the causes and effects of vibration and formulate the Frequency response function-amplitude and phase plots, mechanical impedance and mobility . |
| CO 2 | <i>Analyze & Formulate</i> the Duhamel's integral impulse response function , shock spectra, Laplace and Fourier transform methods |
| CO 3 | <i>Analyze & Formulate</i> the Eigen values and Eigen formulation matrix iteration techniques – normal modes and orthogonality transient response of multidegree freedom system. |
| CO 4 | <i>Analyze & Formulate</i> the Longitudinal and transverse vibration of beams-forced response of beams, Vibration of plates –finite element techniques in vibration analysis. |
| CO 5 | <i>Classify ,Analyze</i> the Vibration measuring instrumentation. |
| CO 6 | <i>Define, Classify, Analyze</i> the Sound and Noise parameters, prorogation of sound noise in various machinery's noise measurements techniques. Noise Control Techniques, Sound absorption , sound insulation , methods. |



COURSE DATA SHEET

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| PROGRAM: MECHANICAL ENGINEERING DESIGN | DEGREE: M. TECH |
| COURSE: ROBOTICS | SEMESTER: II CREDITS: 04 |
| COURSE CODE: 2MED03 REGULATION: 2017 | COURSE TYPE: CORE /ELECTIVE / BREADTH/ S&H |
| COURSE AREA/DOMAIN: MECHANICAL ENGG. | CONTACT HOURS: 3+1 (Tutorial) hours/Week. |
| CORRESPONDING LAB COURSE CODE (IF ANY): NO | LAB COURSE NAME (IF ANY): NO |

SYLLABUS:

| DETAILS | HOURS |
|---|-----------------------|
| <p>2MED - 03 ROBOTICS</p> <p>Basic concepts in Robotics: Advanced and applications of robotics of Robots, Resolution, Accuracy and Repeatability, Point, Continuous part system control loops, types of manipulators, wrist & Grippers.</p> <p>Kinematic Analysis of Robots.</p> <p>GBeometry based direct kinematics, Co-ordinate and vector transformation using matrix, Denant - hartenberg Convention, application of DH notation, Inverse Kinematics.</p> <p>Robot- An Dynamcis : Elementary treatment of Lagrange - Euler, Newton - Euler formulations, Generalised D Alembert equations of motion .</p> <p>Drives, Control of Trajectory : Hydraulic system stepper motor, Direct current servomotors , A.- C.servomotors, adaptive control, interpolators, trajectory planning, resolved motion rate control method.</p> <p>Robotic Sensors : Vision system ,range ,proximity, touch, force and torque sensors, Assembly-Aid devices, Robot programming, Artificial Intelligence.</p> <p>Application of Robot : Handling loading, unloading welding, Painting Assembly, Machining Manufacturing , Work- cell, Installation of Robots .</p> | 04 Hrs per Week |
| TOTAL HOURS | 48 |

TEXT/REFERENCE BOOKS:

| T/R | BOOK TITLE/AUTHORS/PUBLICATION |
|-----|--|
| T | M.P. Groover, M.Weiss, P.N.Nagal, and N.G Odrey, Industrial Robotics, Mc Graw Hill International Deduction, 1986. |
| T | M.P. Groover, M.Weiss, P.N.Nagal, and N.G Od.ey, Industrial Robotics, Mc Graw Hill International Deduction, 1986. |
| T | Fu. K. S. , Gonzalez R. C. and Lee C. S. G., Robotics : Control sensing vision and intelligence, Mc Graw Hill, 1987. |
| T | D. T. Pham , Expert – System in Engineering , Springer Verlog , 1988. |
| R | Anthony C. , Mc Donald, Robot Technology, theory , design and applications, Prntice Hall, New Jersey, 1986. |
| R | Yoren Koren , Robotes for engineers. |
| | K. S. Fu, R.C. Gonzaler C.S.G. Lee, Robothes (Control, sensing vision & intelligence). |

COURSE PRE-REQUISITES:

| C.CODE | COURSE NAME | DESCRIPTION | SEM |
|--------|-------------|-------------|-----|
| | NA | | |
| | NA | | |

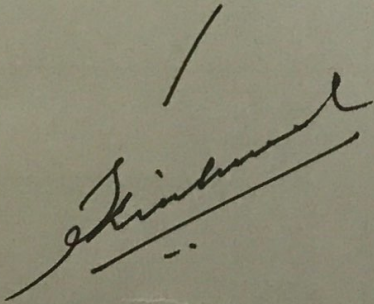
COURSE OBJECTIVES:

| | | | |
|---|---|--|--|
| 1 | To acquaint the students with importance of robotics in today and future goods production | | |
| 2 | To able to understand robot configuration and subsystems. | | |
| 3 | To able to understand application of robot | | |
| 4 | To acquire the knowledge on advanced algebraic tools for the description of motion | | |

COUSRE OUTCOMES

The student will be able to

1. define robots and their various characteristics
2. understand and analyze and solve problems on direct kinematics and inverse kinematics.
3. defend elementary treatment of Lagrange Euler, Newton –Euler formulations and D Alembert equations of motion.
4. to list and explain types of drives and define trajectory planning.
5. explain and select sensors for robots and classify programming techniques.
6. To list and select robots for various engineering fields applications.



Anjuman College of Engineering and Technology, Nagpur

Course Outcomes

Program:-M. Tech. (Mechanical
Engineering Design)

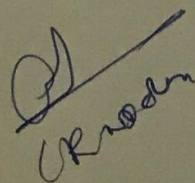
Sem:-1st

Course/Course Code: Computer Aided mechanical Design
/PGMED104T

Course Coordinator : R.N.Dehankar

Academic year:-2017-18

| CO | CO-STATEMENT |
|----------------|---|
| CO PGMED104T.1 | Write & Explain how pixel position are located and displayed on computer screen in order to generate any basic geometric entities. |
| CO PGMED104T.2 | Apply transformations on 2D & 3D objects, and determine the final state and shape of object. |
| CO PGMED104T.3 | Explain the different geometric modeling techniques, synthetic curves & methods of assembly modeling. They can create any model using the same. |
| CO PGMED104T.4 | To understand and write the algorithm for programming module for the design of various components like shaft , flywheel ,gear ,bearings etc. |


R.N. Dehankar

3.1.1

Programme: Mechanical Engineering

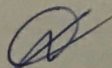
Course: ADVANCED MECHANISM

Course Code: **PGMED106P**

Course Outcomes:

The Student would be able to:

| | |
|----------|--|
| CO106P.1 | Explain the Synthesis of mechanism using function generation and path generation |
| CO106P.2 | Apply kinematic analysis and synthesis to generate 4-bar mechanism |
| CO106P.3 | Analyze special 4-bar mechanism |
| CO106P.4 | Synthesize --bar mechanism using graphical approach |
| CO106P.5 | Explain kinematic Synthesis of robotic arm. |


Prof. Syed Mohiuddin
Subject coordinator

Programme: Mechanical Engineering

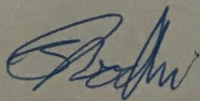
Course: Mechanical Vibrations

Course Code: **PGMED103P**

Course Outcomes:

The Student would be able to:

| | |
|--------------|---|
| PGMED103P1.1 | Explain and discuss Vibration problems in engineering causes and effects of vibration relevance of vibration analysis. |
| PGMED103P1.2 | Duhamel's integral impulse response function – shock spectra –Laplace and Fourier transform methods. |
| PGMED103P1.3 | Matrix formulation Eigen values and Eigen formulation matrix iteration techniques |
| PGMED103P1.4 | Longitudinal and transverse vibration of beams-forced response of beams. Vibration of plates –finite element techniques in vibration analysis. |
| PGMED103P1.5 | Explain and discuss Vibration measurements instrumentation electrodynamics exciters – impact hammers piezoelectric accelerometers, digital Fourier transforms FFT analysis structural frequency response. |
| PGMED103P1.6 | Sound and Noise parameters prorogation of sound noise in carious machinery's noise measurements techniques. Noise Control Techniques, Sound absorption, sound insulation, methods. |



Prof. Jawwad A.K. Lodhi

Subject coordinator

COURSE OUTCOMES

Program: Master of Technology (Mechanical Engineering Design)

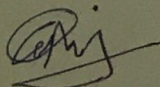
Course: Advanced Mechanical Drives

Subject Code: PGMED201T

Course Coordinator: Mr. Gaurav S. Bhusari

Course Outcomes -The students will be able to understand critical and detailed analysis of various mechanical drives along with its Vibration analysis.

| Sr. No. | Description |
|---------|--|
| CO 1 | Belt Drives: Belt vibrations, additional stress due to vibration, modern development in toothed belt, fatigue, synchronization, slip due to wear. Dynamics & vibration of Arms of Pulleys |
| CO 2 | Gears: Detailed dynamics of gear tooth, spur tooth vibrations, Estimation of additional stress under vibration. Fatigue in tooth due to contact stress. Exact estimation of gear meshes frequencies in signature analysis. |
| CO 3 | Gear Boxes: Kinematic Analysis of complex gear trains, Force Analysis including gyroscopic effects, Vibration Analysis of Gearboxes, Lubrication Methods, Contamination of Lubrication Oils, wear debris analysis. |
| CO 4 | Chain Drives : Detailed dynamics of chains considering Rolling friction of hanging portion of tracks, Resistance of sprocket bearings, Resistance due to chain stiffness ,chain vibrations : Lateral & longitudinal, wear debris formation & effect on efficiency, impact loads in chains. Analysis of power & conveyor chains. |
| CO 5 | PIV Drives: Concept, Need, Classification & Types. Detailed kinematics & dynamics of 4/5 important drives. |
| CO 6 | Couplings: Stress analysis of coupling bolts during one rotation, Rubbing of coupling pins & its effect on signature, Analysis due to misalignment, Degree of shock absorption due to flexible elements in flexible couplings. |



Prof. Gaurav Bhusari

Programme : **Mechanical Engineering Design**

Course : **Stress Analysis**

Course Code : **PGMED202T**

CREDITS : **04**

Teaching Scheme Examination Scheme

Lectures: 4 Hours/Week Duration of Paper: 03 Hours University Assessment: 70 Marks College Assessment: 30 Marks

Course Objectives and Expected Outcomes: The overall objectives of this course is to understand the fundamental of stress and strain, application of equation of equilibrium, compatibility, Airy's stress function for determining stress field in Cartesian coordinate and polar co-ordinate for two dimensional problems, various methods of experimental stress analysis using strain gauges, strain rosettes and photo elasticity, evaluation of thermal loads and thermal stress in simple object and given systems, fundamental of fracture mechanics.

COURSE OUTCOME

The students will be able to

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|----------|---|
| CO202. 1 | Define, Classify, Analyze fundamentals of stress & strain, relationship, Elastic constant , plane stress & strain and formulate equations of Equilibrium, compatibility equation, Airy's stress function. |
| CO202. 2 | Classify, Analyze & Formulate the two dimensional problems in polar co-ordinates, general equations in polar co-ordinates for any symmetric case, pure bending of curved beams |
| CO202. 3 | Analyze & Formulate torsion of non circular section |
| CO202. 4 | Analyze & Formulate Experimental stress analysis by strain gauge & photo elasticity technique as well as Classify strain rosettes, recording Instruments & fringes. |
| CO202. 5 | Analyze beams under thermal load & Formulate Thermo elasticity in thin circular discs, turbine rotors etc. |
| CO202. 6 | Define, Classify, Analyze fracture Mechanics |

COURSE DATA SHEET

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|--|-----------------------------|
| PROGRAM: Mechanical Engineering Design | DEGREE: M.Tech. |
| COURSE: Design of Mechanical Handling System | SEMESTER: II CREDITS: |
| COURSE CODE: PGMED203T REGULATION: | COURSE TYPE: CORE |
| COURSE AREA/DOMAIN: | CONTACT HOURS: 4hours/Week. |
| CORRESPONDING LAB COURSE CODE (IF ANY): | LAB COURSE NAME (IF ANY): |

COURSE OUTCOMES:

| SNO | DESCRIPTION |
|--------------|--|
| PGMED203T .1 | The study of Design of various Mechanical handling systems is concerned with understanding of various industrial system and devices with its basic design. |
| PGMED203T .2 | Constructional features, operation, operational characteristics advantages Disadvantages, limitations, Design considerations of conveying machines. |
| PGMED203T .3 | Design of Belt conveyers , chain conveyers, Roller conveyers, (Gravity & Powered) |
| PGMED203T .4 | Design of Screw conveyers, Tubular screw conveyers, Escalators, Vibrating conveyers, (Crank type & spring type), Pneumatic conveying. |

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(R. V. S. 9/10)

Programme: Mechanical Engineering

Course: Foundation Course I: Research Methodology

Course Code: PGHPE205T

Course Outcomes:

The Student would be able to:

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|-----|--------------------|---|
| CO1 | Bloom Level 1,2 | Knowledge on various kinds of research problems and research designs |
| CO2 | 5 | Formulate research problems (task) and develop research design |
| CO3 | 3 | Asses the appropriateness of different kinds of research designs |
| CO4 | 1,2 | Knowledge on qualitative ,quantitative and mixed methods of research as well as relevant ethical and philosophical considerations |
| CO5 | 4 | Develop independent thinking for analyzing research reports. |

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Subject Teacher

Dr. Leena Gahane

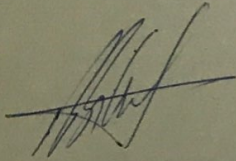
Programme : **Mechanical Engineering Design**

Course : Stress Analysis

Course Code : PGMED206P

CREDITS : 01

| | |
|---------|--|
| CO206.1 | Study of compatibility equation in Cartesian co-ordinate. |
| CO206.2 | Study of two dimensional problems in polar co-ordinates. |
| CO206.3 | Study of St. Venants theory |
| CO206.4 | Study of electric resistance strain gauge, gauge circuit, calibration of different photo elastic material and determination of material fringe value by using diffused liquid research Polaris cope. |
| CO206.5 | Study of beam under thermal load. |
| CO206.6 | Study of fracture mechanics. |



Prof. Bilal Abdullah Baig

(Mech Dept)

| | |
|-----------|---|
| PGMED204T | Elective –III (Discipline) Tribology and Bearing Design |
|-----------|---|

CREDITS: 04

Course Outcomes: Students will be able to

| CO | DESCRIPTION | KEYWORD | LEVEL OF BLOOM'S TAXONOMY |
|-------------|---|---------------------|---------------------------|
| PGMED204T.1 | Understand & Explain Basic Principles of friction, wear & lubrication & its interrelation with tribology. | Understand, Explain | 2 |
| PGMED204T.2 | Explain Reynolds Equation & its Limitation, Concepts & Derivations involved in infinite & finite – hydrostatic & hydrodynamic bearings. | Explain | 2 |
| PGMED204T.3 | Explain concepts & equations involved in Elasto-Hydrodynamic Lubrication, Rolling Motion & Tire Road Interaction. | Explain | 2 |
| PGMED204T.4 | Understand the tribological aspects in Aerostatic, Gas Bearing & Wheel on Rail Contact. | Explain | 2 |

*Shah
Shehaz Ahmad*

COURSE DATA SHEET

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|--|-------------------------------|
| PROGRAM: Mechanical Engineering Design (MED) | DEGREE: M.Tech |
| COURSE: FINITE ELEMENT ANALYSIS | SEMESTER: II CREDITS: 01 |
| COURSE CODE: PGMED207P REGULATION: Fulltime | COURSE TYPE: |
| COURSE AREA/DOMAIN: MACHINE DESIGN /CAD/CAE | CONTACT HOURS: 2 Hours/Week |

COURSE OUTCOMES:

| SNO | DESCRIPTION | PO(1..12) & PSO(1..2) MAPPING |
|---------|--|--|
| CO802.1 | Understand the basics of analysis by using ANSYS software (L1,2) | PO1,2,3,5,8,9,10,12 PSO1,2,3 |
| Co802.2 | Understand and Explain preprocessor , processor(Solution) and postprocessor in ANSYS(L1,2) | PO1,5,8,9,10,11,12 , PSO1,2,3 |
| CO802.3 | Model finite element problems using commercial software and understand the fundamental use of finite element preprocessor.(L1,2,3) | PO1,2,3,4,5,8,9,10,11,12, PSO1,2,3 |
| CO802.4 | Evaluate and interpret FEA analysis results for design and evaluation.(L1,2,3,5) | PO1,2,3,,4,5,8,9,10,11,12, PSO1,2,3 |
| CO802.5 | Evaluate the aspects of finite element formulation for solving engineering problems(L1,2,3,4,5) | PO1,2,3,4,5,8,9,10,12, PSO1,2,3 |

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|---|------------------------------|
| PROGRAM: MECHANICAL ENGINEERING | DEGREE: PG |
| COURSE: Foundation Courses –II (PROJECT PLANNING, EVALUATION & MANAGEMENT) | SEMESTER: CREDITS: 04 |
| COURSE CODE: PGMED302T REGULATION: | COURSE TYPE: CORE |
| COURSE AREA/DOMAIN: | CONTACT HOURS: 4 hours/Week. |
| CORRESPONDING LAB COURSE CODE (IF ANY): | LAB COURSE NAME (IF ANY): |

COURSE OUTCOMES:

| SNO | DESCRIPTION. |
|--------------------|--|
| CO MED3 02.1 | Students will be able to Develop a basic needs assessment for a proposed project, by analyzing the different phases of project, impacts of delays and essentials of project(L3, L4) |
| CO MED3 02.2 | Students will be able to Select and Develop a project proposal by identifying the different processes and applying organizational structural concept(L3) |
| CO MED3 02.3 | Students will be able to Develop a logical framework and project budget by Evaluating the cost estimate, resources, schedules and risks.(L3, L5) |
| CO MED3 02.4 | Develop measureable indicators for quality assessment. (L6) |
| CO MED3 02.5 | Students will be able to Formulate the Monitoring and Evaluation into a project, Develop a grant proposal, evaluate the various project closing conditions and recommend the project closure. (L6, L3, L5) |

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Programme: Mechanical Engineering

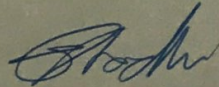
Course: Finite Element Analysis

Course Code: PGMED301T

Course Outcomes:

The Student would be able to:

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|--------------|--|
| PGMED301T1.1 | Explain and discuss the finite element method, review of Basic concepts of elasticity, principle of minimum potential energy, principle of virtual displacements. |
| PGMED301T1.2 | Boundary value problems, approximate method of solution, review of variational calculus, the Euler-Lagrange equations, method of weighted residuals. Raleigh Ritz and Galerkin methods –finite element formulations the finite element basis, displacement models. |
| PGMED301T1.3 | Parameters functions, one dimensional element, global coordinates, natural co-ordinates, three dimensional elements, four noded tetrahedral element. two dimensional elements, three noded triangular and four noded quadrilateral elements, |
| PGMED301T1.4 | Formulations and shape functions for one dimensional, two dimensional and three dimensional elements, numerical quadrate formulae, Jacobean matrices and transformations. |
| PGMED301T1.5 | Explain and discuss Formulation of the problems of axial, tensional and flexural deformations of beams, plane stress, plane strain and axis symmetric problems. |



Prof. Jawwad A.K. Lodhi

Subject coordinator

COURSE DATA SHEET

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| PROGRAM: MECHANICAL ENGINEERING | DEGREE: M.TECH.(MECHANICAL ENGINEERING DESIGN) |
| COURSE: PROJECT SEMINAR /PROJECT | SEMESTER: VIII CREDITS: 04 |
| COURSE CODE: PGMED303P / PGMED401P REGULATION: 2015 | COURSE TYPE: CORE /ELECTIVE / BREADTH/ S&H |
| COURSE AREA/DOMAIN: MECHANICAL ENGINEERING | CONTACT HOURS: 06 hours/Week. |
| CORRESPONDING LAB COURSE CODE (IF ANY): YES | LAB COURSE NAME (IF ANY): YES |

SYLLABUS:

| DETAILS | HOURS |
|--|--------------------------------|
| <p>Research Concept :- process of growth of knowledge Mechanical & Industrial Engineering Department generation/realization of new facts , Establishing logic for the generated facts, Scope of quantification of cause effect relationship , Evaluation of hypotheses. Approach Of Formulation Of The Research Task: - Literature review: Sources, Discussions Field studies, Critical analysis of generated facts. Hypothetical proposals for future development, Constraints for proposal selection, Prioritization. Research Approaches: Conceptual research, Theoretical research, applied research, Experimental research: Experimental validation of proposed logic, Experimentation to generate design data. Modeling & Simulation: Concept of modeling, Concept of simulation, Types of simulation (quantitative Experimental, Computer , Fuzzy based , statistical) Process of Model optimization. Formulation of Hypothesis Literature survey work of the topic selected for dissertation References : 1. T.S. Wilkinson & P.L. Bhandarkar , Methods & Techniques of Social Research Himalaya Publishing , Bombay. 2. Averill M.Law & W. David Kelton —Simulation,Modelling & Analysis 3. H. Schenck, Jr. —Theories of Engg. Experimentation Mc-graw Hill —Design of Experiments Montgomery. 4 . Bart Kasko & Klir —Nural Network & Fuzzy Systems Prentice Hall T.J.Roft“ Fuzzy logic with Engg. . Application —Tata mc-Graw Hill — Fuzzy sets, Uncertainties & Information Prentice Hall. 5. S.S. Rao —Optimization Theory & Applications Wiley Eastern Back Volimes of Journal 6. —Modelling & Simulation AMSE Press France .</p> | <p>06 Hrs per week</p> |
| TOTAL HOURS | 06 |

COURSE OUTCOMES:**The student will be able to:**

| SNO | DESCRIPTION | PO(1..12) & PSO(1..2) MAPPING |
|-----------|---|-------------------------------|
| CO806P.01 | Take a specific problem right from its identification and literature review till the successful solution of the same | 1,3 |
| CO806P.02 | Take up any challenging practical problems and find solution by using research methodology. | 1,3 |
| CO806P.03 | Develop a skill to accomplish any task and present seminar in front of departmental committee members along with guide. | 1,3 |
| CO806P.04 | Confident enough to prepare project reports and published papers in journals. | 1, 3 |
| CO806P.05 | Face reviews and viva voce examination in front of the panel of experts and continuously develop one's own knowledge. | 1,2,3 |