COURSE SCHEME
EXAMINATION SCHEME
&
SYLLABUS

Of

First, Second, Third & Fourth Semester Choice
Base Credit System (CBCS)
Of
Master of Technology (M.Tech)

In
Mechanical Engineering Design (MED)
Of

Priyadarshini College of
Engineering,Nagpur

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME101T **Course : Dynamics of Machinery**

L: 4 Hrs. P:0 Hrs. Per week **Credits: 4**

Course Objectives:

The overall objectives of this course is to understand quantitative kinematic analysis, static force analysis, dynamic force analysis, stress distribution in links, dynamics motion analysis which includes energy distribution method, the rate of change of energy method, variation mechanics, balancing of linkages by various methods, natural frequency of given system and balancing of rigid rotors.

Expected Outcomes:

The expected outcomes are students will be able to understand the effect of dynamic forces on various links of a mechanism, dynamic motion analysis, balancing of linkages and flywheel requirement, determination of natural frequency of various systems using different methods.

Syllabus:

1. **Dynamics of Mechanisms:** Forces in mechanisms, friction in links connection, stress distribution in links. Various approaches for dynamic analysis: Lagranjes, Recursive Lagranjes.

2. **Dynamic Motion Analysis:** Energy distribution method, the rate of change of energy method,

3. Balancing of linkages and flywheel requirements. Lagranjian Euler formulation, Hamilton's Formulation, variation Mechanics.

4. **Rotor Dynamics :** Torsional Vibration in reciprocating machines, Critical speed, bending vibration

5. **Balancing of rotating shaft:** .Out of balance, balance of rigid rotors, whirling speed of shaft, hydrodynamic instability

Tutorial: - Based on above syllabus.

References:

1. S.Timoshenko ,Vibration Problems in Engineering.
2. Marplex ,Dynamics of machinery.
3. J.S.Rao,Rotor Dynamics.
4. Housner ,Advanced Dynamics.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME101P **Course : Dynamics of Machinery**

L: 0 Hrs. P:2 Hrs. Per week **Credits: 1**

Based on syllabus of Dynamics of Machinery mention in subject code 23PME101T with emphasis on quantitative kinematic analysis, static force analysis, dynamic force analysis, stress distribution in links, dynamics motion analysis.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME102T **Course : Mechanical Vibrations**

L:4 Hrs. P:0 Hrs. Per week **Credits:4**

Course Objectives:

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.

Expected Outcomes:

The students will able to understand –vibration phenomenonll and its concept, disadvantages and advantages of vibration various techniques to determine natural frequency of the system for any DOF system.

Syllabus:

1. **Review of Fundamentals:** Vibration problems in engineering causes and effects of vibration relevance of vibration analysis continuum and discrete modeling 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.

2. **Response of Systems to Arbitrary Periodic Excitation:** Duhamel's integral impulse response function – shock spectra –Laplace andFourier transform methods.

3. **Multi Degree Freedom Systems:** Matrix formulation Eigen values and Eigen formulation matrix iteration techniques – normal modes and orthgonality transient response of multidegree freedom system mode superposition technique tensional oscillations of malty rotor systems.

4. **Continuous Systems:** Longitudinal and transverse vibration of beams-forced response of beams. Vibration of plates –finite element techniques in vibration analysis.

5. **Vibration Instrumentation and Noise Control :** Vibration measurements instrumentation electrodynamics exciters impact hammers piezoelectric accelerometers signal conditioning and amplification preamplifiers and power amplifiers real time analysis digital Fourier transforms FFT analysis structural frequency response measurement random sinusoidal and transient test methods model testing of beams.Sound and Noise parameters prorogation of sound noise in carious machinery's noise measurements techniques. Noise Control Techniques, Sound absorption, sound insulation, methods.

Tutorial: - Based on above syllabus.

REFERENCE :

1. J.S. Rao and K. Gupta Advanced theory of vibration.Willey Eastern.1992.
2. P.Srinivasan Mechanical Vibration Analysis, Tata Mc Graw Hill, New Delhi 1982.
3. N. L. Meirovitch , Elements of vibration Analysis, Mc Graw Hill New York 1986.

4. J.P.Den Hartog Mechanical Vibration (4^{th} edition Mc Graw Hill, New York 1985.
5. Timoshenko, Engineering vibration.
6. Irwin & Garf , industrial Noise & Vibration Control.
7. R.A. Collacott, Vibration Monitoring and diagnosis, John Willey, New York, 1979.
M. Petyt , Introduction to Finite Element Vibration Analysis Cambridge University Press,Cambridge 1990.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME102P **Course : Mechanical Vibrations**

L:0 Hrs. P:2 Hrs. Per week **Credits:1**

Based on syllabus of mechanical vibrations mention in subject code MT103T with emphasis on vibration measurement on equipment and machinery.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME103T **Course : Research Methodology and IPR**

L:2 Hrs. P:0 Hrs. Per week **Credits:2**

Course Objectives:

The objective of this course is to provide students with:

1. An insight into how scientific research is conducted

2. Knowledge of Research Process, Concepts, diverse research tasks and equip them to undertake research.

3. Understanding the concepts of Data collection, system modeling and reliability.

4. To develop an understanding for the optimization methods in research work.

5. Methods for presentation of research results.

Course Outcomes:

At the end of this course, students will be able to

1.Understand research problem formulation.

2.Analyze research related information

3.Follow research ethics

4.Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

5.Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

6.Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Syllabus Contents:

UNIT I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT II: Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT III: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT IV: Nature of Intellectual Property: Patents, Designs, Trade and Copyright, Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT VI: New Developments in IPR:

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

5. Mayall, "Industrial Design", McGraw Hill, 1992.

6. Niebel, "Product Design", McGraw Hill, 1974.

7. Asimov, "Introduction to Design", Prentice Hall, 1962.

8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME111T **Course : Computer Aided Mechanical Design**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objectives:

The subject deals with the solid and 2-D modeling of machine elements by using computers which was earlier were carried out manually. The objective of the course is to study representation of geometrical entities like line, circle, curves, surfaces and solid parts mathematically and hence computer software can be used for modeling of any engineering entities.

Expected Outcomes:

The student will learn modeling, drafting and dimensioning of machine elements by using computer software and will be able to generate several alternate design options very easily. Also students will understand the requirements of hardware & software for computer aided design process.

Syllabus:

1. Product Cycle: Role of Computers in the design process. Requirement of Hardware & Software in CAD. Representation of Line, Circle, & Other analytic curves,

2. Algorithms & Programs. Drafting of machine elements with dimension and tolerances using 2-D drafting packages. Graphic standards GKS [Graphical KernalSystem]IGES[InitialGraphic Exchange Specifications].

3. 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.

4. Curves : Mathematical representation of Hermite cubic, Bezeir & B-spline curves.

5. Geometric Modeling: Introduction to difference t y p e of surfaces and solids generated in surface and solid model respectively. Assembly modeling and interference checking .

Tutorial: - Based on above syllabus.

Reference:

1. Groover ,M.P.and Zimmers ,E.W CAD/CAM, Computer Aided Design and manufacturing, Prentice Hall of India 1986
2. Ibrahim Zeid, CAD/CAM Theory and Pratice, Mc Graw Hill, 1991.
3. Dimarogons, A.D. Computer Aided Machine Design, Prentice Hall,1986.
4. Ranky, P.G. Computer Integrated Manufacturing,Prentice Hall,1986.
5. Radhakrishanan,P. and Kothandaraman, C.P. Computer Graphics & Design, Dhanpat Rai & Sons, Delhi, 1990.
6. Software Manuals on GEODRAW, GEOMOD, and SUPERTAB, Structural Dynamics Research Corporation, U.S.A. 1986

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME112T **Course : Reliability, Maintainability & Wear**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objectives:

The course deals with study of reliability, availability, maintainability and wear of machine and its components. The objective of this course is to perform reliability engineering analysis, to understand the maintainability and estimate wear of machines and their components.

Expected Outcomes:

The student will be able to estimate the life of machine and their components and various maintenance processes. Also student will understand basic reliability measures such as MTTF, MTBF, MTTR, availability, failure rate, Bathtub curve, etc.

Syllabus:

1. Introduction to reliability availability and maintainability failure distributions, Weibull distribution and its applications to industries.
2. Design and manufacturing for reliability, reliability assessment of mechanical systems
3. FMES and FTA techniques.
4. Monte carlo simulation method, markov chains in reliability. Maintenance policies
5. Philosophies conditions based antennae , Vibration monitoring non destruction testing.

Tutorial: - Based on above syllabus.

References:

1. Reliability & Maintainability Engineering Charles E. Ebeling – Tata Mc Graw Hill
2. Reliability Methods Engineering and its application – G.P. Chhalotra –Khanna
3. Introduction to Reliability in Design –Charles O. Smith – Mc. Graw Hill
4. Reliability Engineering –E. Bala guruswamy –Tata Mc. Graw Hill
5. Reliability Engineering –D.J. Smith- Pitman Publishing
6. Reliability Engineering –L.S. Srinath –Affiliated East West Press Pvt. Ltd.
7. Mechanical Reliability – A.D.S. Carter- Mc Millan
8. Friction and Waer of Material –Ernest Rabinowicz-John Wiley & Sons
9. Kapur K. C. , Lamberson L.R. Reliability in engineering Design.
10. Thomson A. Reliability Based Mechanical DesignHull B. , Jhon V. , Non Destructive testing.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME113T Course : Machine Tool Design

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

To develop in the engineering students the ability to analyze any engineering problem in a simple and logical manner and to apply to its solution a few, well understood basic principles.

Course Outcomes: This subject deals with the basic structure of machine tools , its design and design of gear box, guides , and other machine tool elements.

Unit 1:

Introduction, classification, general requirements, characteristics, technical and economical prerequisites for machine tool design, machine tool design process, machine tool layout, motion in machine tool, machine tool drives, hydraulic and mechanical drives,types and elements, individual and group drives, devices for intermittent motion, reversing and differential mechanism, selection of electric motor.

Unit 2:

Aim of speed and feed regulations, stepped regulations of speed-Various laws of step regulation, Selection of range ratio, Standard value of Geometric progression ratio and guidelines for selection proper values, Breakup of speed steps, Structure diagrams and its analysis, Classification of speed and feed boxes, design of feed box, machine tool drives using multiple speed motors, Special cases of gear box Design speed box with Overlapping speed steps, Speed box with combine structure, Speed box with Broken geometric progression, electromechanical system of regulation, Friction, Pressure and Ball Variations, Epicyclic Drive.

Unit 3:

Function and requirement of machine tool structure, design criteria from strength and stiffness consideration, concept of unit rigidity, unit strength under bending for material of machine tool structures, compare steel and cast iron on the basis of material properties,manufacturing problems and economy, role of static and dynamic stiffness in design of elements of machine tools, profiles of machine tool structures, factors affecting stiffness of machine tool structures.

Unit 4

Function and types of Guideways, types of slideways and antifriction ways, functional features of slides ways, its shapes and materials, methods of adjusting clearance, design criteria (wear resistance and stiffness) and calculations for slideways operating under semi liquid friction condition, stick slip phenomenon affects accuracy of setting and working motions, comparision of design
and stiffness of hydrodynamic, hydrostatic and aerostatics slide ways, design of antifriction Guideways, concept of combination of Guideways, Design of sliding friction power screw for wear resistance, strength, stiffness and buckling stability, design of rolling friction power screw for strength under static loading.

Unit 5

Function and requirements of spindle units, their materials, effect of machine tool compliance on machining accuracy, design of spindles for bending stiffness: deflection of spindle axis due to a) bending b) compliance of spindle supports c) compliance of tapered joints, optimum spacing between spindle supports permissible deflection and design for stiffness: additional check for
strength like additional supports, location of bearings and drive elements, balancing.

Text Books:

1) Machine Tool Design N. K. Mehata TMH
2) Principles of Machine Tools –Gopal Chandra Sen , Amitabh Bhattacharya New central book agency
3) Machine Tool Design Basu, Pal Oxford IBH
4) Technology of Machine Tool by Steve F. Krar Indian Edition 2013 (McGraw Hill)

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME121T **Course : Robotics**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objective:

The course deals with various robot components, kinematic and dynamic analysis and control of robot manipulator. The objective of this course is to learn various components, configuration, programming method and applications of robot.

Expected Outcomes:

The student will be able to perform kinematic analysis i.e. robot mechanism synthesis and its dynamic analysis to calculate the forces and torque required to actuate the joints and hence intern can select proper linear and rotary actuators. Also student will understand motion analysis, trajectory planning of end effectors, various robot sensors and programming methods.

Syllabus:

UNIT - I

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.

UNIT - II

Kinematic Analysis of Robots. Geometry based direct kinematics, Co-ordinate and vector transformation using matrix, Denant - Hardenberg Convention, application of DH notation, Inverse Kinematics.

UNIT - III

Robot- an D y n a m c i s : Elementary treatment of Lagrange - Euler, Newton - Euler formulations, Generalised D Alembert equations of motion.

UNIT - IV

Drives, Control of Trajectory: Hydraulic system stepper motor, Direct c u r r e n t servomotors, A-C servomotors, adaptive control, interpolators, trajectory planning, resolved motion rate control method.

UNIT - V

Robotic Sensors: Vision system, range ,proximity, touch, force and torque sensors, Assembly Aid devices, Robot programming, Artificial Intelligence.

Application of Robot: Handling loading, unloading welding, Painting Assembly, Machining Manufacturing , Work- cell, Installation of Robots .

Tutorial: - Based on above syllabus.

References :

1. M.P. Groover, M.Weiss, P.N.Nagal, and N.G Odrey, Industrial Robotics, McGraw Hill International Deduction, 1986.
2. Shimon Y. Nof (Editor), hand book of industrial robotics Jhon Wiley and sons, 1985,
3. Fu. K. S. , Gonzalez R. C. and Lee C. S. G., Robotics : Control sensing vision and intelligence, Mc Graw Hill, 1987.
4. D. T. Pham , Expert – System in Engineering , Springer Verlog , 1988.
5. Anthony C. , Mc Donald, Robot Technology, theory , designand applications, Prntice Hall, New Jersey, 1986.
6. Yoren Koren , Robotes for engineers.
7. K. S. Fu, R.C. Gonzaler C.S.G. Lee, Robothes (Control, sensing vision & intelligence).

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME122T **Course : Mechanization In Food Processing**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objective:

The course deals with the various processes in food processing as cleaning material, sorting, heat processing, dehydration, packaging etc. The course objective is to learn the basics involved in above mentioned various food processing processes and engineering solutions to them.

Expected Outcomes:

The students will be able to understand the various constructional and operational characteristics of food processing devices and will be able to design unit for particular food processing application.

Syllabus:

I Constructional features, operation, Operational characteristics Advantages & Disadvantages,

II Limitations designing considerations of following food processing devices. Cleaning of new materials, sorting and grading.

III size reductions and Expression, centrifugation, crystallizations, Heat Processing , Evaporation.

IV Dehydration, Freezing, Irradiation ,Pumps, piping, packaging.

V Automation and Computer systems, Lubrication, Food plant design.

Tutorial: - Based on above syllabus.

References

1. J.G. Brennan Butters " Food Engineering operations ". Elsevier Publication
2. Farral " Food Engineering System", AVI publishing .
3. Ian McFarlane," Automatic Control of Food Manufacturing Process ", Applied Science Publishing .

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME123T **Course : ARTIFICIAL INTELLIGENCE**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objectives: To learn about the automation of machines tools making the system intelligent.

Course Outcomes: Understanding the different techniques used for implementation of artificial intelligence.

UNIT 1

Human and machine intelligence, Artificial Intelligence (AI), Programming in AI environment,. Natural Language processing (NLP), Need of AI.

UNIT 2

Architecture of an Expert system, Knowledge base, inference engine forward and backward chaining, use of probability and fuzzy logic. Selection of inference mechanism, (Relevant case studies)

UNIT 3

Neural Network and application artificial neural network models, NN applications in Cellular manufacturing and other areas of mechanical Engg..(Relevant case studies)

UNIT 4

Introduction to Rule Based System. Conflict Resolution Advantages and Drawbacks of Rule Based Systems Clausal Form Logic, Rule Base Verification, Refinement and Validation.

Creating Knowledge Base, Knowledge Engineer and Domain Expert, Phases of Knowledge Engineering, Tools for Knowledge Engineering.

UNIT 5

Fundamentals of OOP (Object oriented programming), creating structures and objects, object operations, invoking procedures, programming applications, Object oriented expert systems. Semantic nets, structure and objects, ruled systems for semantic nets, certainty factors, automated.

Books for Reference:

- Addis, T.R., "Designing Knowledge Based System", Prentice Hall, 1985.
- Rolston, D.W., "Principles of Artificial Intelligence and Expert Systems Development", McGraw Hill, 1988.
- Maus, R. and Keyes, J., "Handbook of Expert Systems in Manufacturing", McGraw Hill, 1991
- Robert Levine, "A comprehensive guide to artificial intelligence and expert systems",Elain Rich ,"Artificial Intelligence",
- Sasikumar, Ramani, et al ,"Rule based expert systems".
- Graham Winstanley, "Program Design for Knowledge Based Systems", Galgotia Publications.
- Artificial Neural Networks", Zurada
- V.B. Rao and H.V. Rao, "C++ : Neural Networks and Fuzzy Logic", BPB Publications.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME131A **Course : English For Research Paper Writing**

L:2 Hrs. P:0 Hrs. Per week **Credits:**

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Ensure the good quality of paper at very first-time submission.

Course outcomes:

Students will be able to

1. Understand & differentiate between literary piece of writing & Technical Writing.
2. Write technical documents in clear, concise & effective manner
3. Design own style of writing to inform or instruct an audience with a specific goal in mind.
4. Will be able to write proposals.
5. Will be able to design, create and write technical manuals.

Syllabus

UNIT I: Planning and Preparation, Word Order, Breaking up long sentences,Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT II: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

UNIT III: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNITIV: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNITV:Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

UNIT VI:useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.

4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME132A **Course : Disaster Management**

L:2 Hrs. P:0 Hrs. Per week **Credits:**

Course Objectives: -Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Course outcomes:

Students will be able to

1.To work as a think tank for the society by providing assistance in policy formulation.

2.Develop ability and understanding of disaster mitigation and management.

Syllabus

UNIT I: Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II :Repercussions Of Disasters And Hazards: Economic Damage, Loss Of 4 Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts**.**

UNITIII:Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides

And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT IV:Disaster Preparedness And Management : Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard;Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT V:Risk Assessment: Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT VI: Disaster Mitigation:Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

SYLLABUS OF SEMESTER I, M. TECH. (MED)

Course Code: 23PME133A **Course : Value Education**

L:2 Hrs. P:0 Hrs. Per week **Credits:**

Course Objectives:

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Course outcomes:

Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality.

Syllabus

UNIT I:

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.

Moral and non- moral valuation. Standards and principles,Value judgements

UNIT II:

Importance of cultivation of values.

Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.

Honesty, Humanity. Power of faith, National Unity.

Patriotism.Love for nature,Discipline

UNIT III:

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.

Punctuality, Love and Kindness.

Avoid fault Thinking.

Free from anger, Dignity of labour.

Universal brotherhood and religious tolerance.

True friendship.

Happiness Vs suffering, love for truth.

Aware of self-destructive habits.

Association and Cooperation.

Doing best for saving nature

UNIT IV:

Character and Competence –Holy books vs Blind faith.

Self-management and Good health.

Science of reincarnation.

Equality, Nonviolence,Humility, Role of Women.

All religions and same message.

Mind your Mind, Self-control.

Honesty, Studying effectively

Suggested reading

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME201T **Course : Advanced Mechanisms**

L:4 Hrs. P:0 Hrs. Per week **Credits:4**

Course Objectives:

The overall objectives of this course is to understand kinematics synthesis of mechanism, to learn how to synthesis a given mechanism, when input and output is given with different methods optimal synthesis of mechanism, and synthesis of spatial mechanism along with application.

Expected Outcomes:

At the end of this course students will be able to understand various methods of synthesis, optimization of synthesis, graphical and analytical methods of synthesis along with computer application.

Syllabus:

1. Introduction to kinematic synthesis type number and dimension synthesis practical applications, degree of freedom class -I, class-II chain Grumblers criteria, concept of transmission angle.

2. Synthesis of planner mechanism: Introduction to function generation, path generation, path generation & rigid body guidance. Problems, accuracy points chebychev's spacing, Graphical approaches for synthesis for above problem Central point curve, circle point curve ,point position, inflection circle Bo-billior construction, Euler's savory equation, Hartman construction, vector approach &matrix approach, rotation matrix, displacement matrix, Freudenstein"s equation, computer approach for the above problem .

3. Optimal synthesis of planar mechanisms, Powells search methods least square method penalty function computer approach.

4. Kinematic analysis & synthesis of spatial mechanisms Hi notations screw matrix, kinematic analysis for linkages like R-S-S-R, R-C-P-R-C etc.

5. Introduction to kinematics synthesis of Robot arms.

Tutorials: - Based on above syllabus.

References:-

1. Tao, D.C.,Applied Linkages.
2. Erdman & Sandor ,Advanced Mechanisms, Vol.- I,II,
3. Denavit & Hartenberg, –Kinematic Synthesis

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME202T **Course : Advanced Mechanical Drives**

L:4 Hrs. P:0 Hrs. Per week **Credits:4**

Course Objectives:

The study of Mechanical Drives concerned with understanding of its various design techniques and its detail analyzer by virtue of vibration. The overall objective of this course is to learn and understand practical use of various applications with its detail design and vibration analysis. This course include belt Vibration with pulley design its vibration response, detail dynamics of gear tooth, spur gear tooth vibration, kinematic analysis of complex gear trains, detailed dynamics and vibration analysis of chains, concept of PIV drive and coupling misalignment.

Expected Outcomes:

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

Syllabus:

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 by three Approaches (1) Equal sharing of load zone (2) Equilibrium of rim (3) FEM Approach.
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.
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.
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.
5. **PIV Drives:** Concept, Need, Classification & Types. Detailed kinematics & dynamics of 4/5 important drives.

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.

Tutorial: - Based on above syllabus.

References:

1. Gear, Spur Helical ,Worm by Earle Buckingham ,Mc-Graw Hill.
2. Rothebirt –Mechanical Design & Systems Handbook‖ Mc-Graw Hill
3. Handbook of shaft Alignment
4. M.P.Alexandrov, –MATEIALS HANDING EQUIPMENT‖, MIR Publications, Moscow 1981.
5. Fairs, –Mechanisms‖ McGraw Hill.
6. J.S. Beggs, —Mechanisms‖ Prentice Hall.
7. David W. South & Jon R. Mancuso‖ Mechanical Power Transmission Components‖ Marcel Dekker inc New York.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME203T **Course : Stress Analysis**

L:4 Hrs. P:0 Hrs. Per week **Credits:4**

Course Objectives:

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 co-ordinate and polar co-ordinate for two dimensional problems, various methods of experimental stress analysis using strain gauges, strain rosettes and photoelasticity, evaluation of thermal loads and thermal stress in simple object and given systems, fundamental of fracture mechanics.

Expected Outcomes:

At the end of this course students will be able to understand how to determine stress field a given object, various strain gauges and strain rosettes for determination of stress field, direction of principle stresses by isoclinic fringer, magnitude of principal stress using isochromatic, stress optic law, evaluation of thermal stresses in a given object and fracture mechanics.

Syllabus:

1. Fundamentals of stress & strain, stress strain relationship, Elastic constant , plane stress, plane strain. Stress Analysis for two dimensional problems in Cartesian co-ordinate system, equations of Equilibrium, compatibility equation, Airy „s stress function, Analysis of rectangular plates by polynomials.

2. Two dimensional problems in polar co-ordinates, general equations in polar co-ordinates for any symmetric case, pure bending of curved beams, crane hooks , bending of beams with initial curvature , Analysis of piston rings, stresses in rotating discs, with variable and constant sections , Effect of holes on stress distribution in plates, contact stresses.

3. Torsion: Torsion of non circular section , St. Venants theory, Membrane analogy , Torsion of thin walled tubes.

4. Experimental stress analysis by strain gauge & photo elasticity technique, strain rosettes, recording instruments, Brittle coating techniques, poloriscope, Isochromatic & isoclinic fringes, compensation techniques.

V Thermal stresses Thermo elasticity, thin circular discs, thermal stresses in turbine rotors, Analysis of beams under thermal load.Introduction to fracture Mechanics.

Tutorial: - Based on above syllabus.

References :

1.Timoshanko & Goodier, Theory of Elasticity.
2.Dalley & Raillery , Experimental stress analysis.
3.Dove & Adams , Experimental Stress Analysis.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME203P **Course : Stress Analysis**

L:0 Hrs. P:2 Hrs. Per week **Credits:1**

List of Practical: (Minimum Eight)

1. Measurement of stress for different types of loading by using strain gauges.
2. Models making for poloriscope.
3. Molding for model material.
4. Verifying theoretical stress distributions on poloriscope.
5. Study of stain gauge.
6. Study of stain analysis using torque gauge.
7. Study of stain analysis using three element rectangle rosettes.
8. Determination of principal stresses using tardy method.
9. Study of plain poloriscope.
10. Study of circular poloriscope.
11. To determine material fringe value by using diffused light research poloriscope.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME204P **Course : Finite Element Analysis**

L:0 Hrs. P:2 Hrs. Per week **Credits:1**

Practical on the standard CAE packages like ANSYS, NASTRAN, ABAQUS,MATLAB, CATIA, UNIGRAPHICS, PRO-E or any other relevant software.

List of Practical: (Minimum Eight)

1. Static structural analysis of bar with 1-D elements using standard FEA package.
2. Static structural analysis of truss with 2-D elements using standard FEA package.
3. Static structural analysis with 2-D CST element using standard FEA package.
4. Static structural analysis with 2-D Axis-symmetric element using standard FEA package.
5. Static structural analysis of a beam in transverse loading using standard FEA package.
6. Dynamic structural analysis to determine natural frequency and mode shapes, using standard FEA package.
7. Analysis of 3-D truss using standard FEA package.
8. Thermal analysis to estimate nodal temperatures using standard FEA package.
9. Application of finite element analysis in the areas like Contact Mechanics, drop test, Crash Analysis, MEMS etc.
10. Finite Element Analysis of live problem/case reported or identified by an Industry.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME211T **Course : Tribology And Bearing Design**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objective:

The course deals with the study of lubrication and its role in bearing design. The course objective is to provide the knowledge of friction, wear and lubrication process, to learn about tribological modeling and simulation and to create an awareness of the importance of tribology in design and selection of machine elements.

Expected Outcomes:

The student will be able to apply the basic theories of friction, wear and lubrication to predictions about the frictional behavior of commonly encountered sliding interfaces as bearings and wheel on rail contact.

Syllabus:

1. Friction and wear Friction control and wear prevention, boundary lubrication, tribological properties of bearing materials and lubricants, theories of friction and wear, instabilities and stick-slip motion .

2. Lubrication of bearings Mechanics of fluid flow, Reynold's equation and its limitations, idealized bearings, infinitely long plane pivoted and fixed show sliders, infinitely long and infinitely short (narrow)

3. journal bearings, lightly loaded infinitely long journal bearing (Petroff's solution), 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

4. 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

5. The Design of Aerostatic Bearings, Gas Bearings, tribological aspects of wheel on rail contact.

Tutorial: - Based on above syllabus.

Reference Books :

1. Principles of Lubrication, Camaron, Longman's Green Co. Ltd.
2. B. C. Majumdar, –Introduction to Tribology and Bearings—, S.Chand and Company Ltd. New Delhi
3. Fundamental of Friction and Wear of Metals – ASM
4. The Design of Aerostatic Bearings – J. W. Powell
5. Gas Bearings – Grassam and Powell
6. Theory Hydrodynamic Lubrication, Pinkush and Sterrolicht
7. Tribology in Machine Design, T. A. Stolarski
8. –Surface Engineering of Metals: Principles, Equipments, Technologies, Taylor and Francis

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME212T **Course : Design of Hydraulic And Pneumatic System**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objective:

The course deals with the study of various hydraulic and pneumatic systems. The course objective is to provide the understanding of hydraulic and pneumatic circuits, their specifications and characteristics, various components and their maintenance.

Expected Outcomes:

The students will be able to design and select the proper hydraulic or pneumatic circuits as per application. Also student will be able to install these system and can recognize any maintenance problem if any in the system.

Syllabus:

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

2. **Hydraulic Actuators:** Linear & Rotary Actuators, Selection, Specification and Characteristics. Pneumatic equipments, selection of components, design calculations, application, fault finding, hydro pneumatic automation, robotic circuits .

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

4. **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.

5. **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 .

Tutorial: Based on above syllabus.

References:

- Peter Rohner, Fluid power logic circuits design the Macmillan Press Limited ,1979.
- Stewart,H.L., Hydraulic and pneumatic power for production, Industrial press, New York 1955.
- Walter Ernest, –Oil hydraulic power and industrial applications, Mc Graw Hill Book,Co 1962.
- Pease ,D.A. –Basic fluid power, Prentice Hall ,1987.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME213T **Course : Plastic Engineering**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objectives: To familiarize students with :1.Various Plastic materials, Their properties and applications 2.Different plastic processing techniques

Course Outcome: Students will be able to :1.Select the suitable plastic material for given application 2.Select suitable plastic processing technique

Unit 1

Chemistry and Classification of Polymers Properties of Thermo Plastics Properties of Thermosetting Plastics Applications Merits and Disadvantages

Unit 2

Extrusion Blow Molding Thermo Forming Rotomolding

Unit 3

Compression and Transfer Molding study of compression molds

Unit 4

Injection Molding study of injection molding machines and molds.

Unit 5

General Machining properties of Plastics Machining Parameters and Their effect

Joining of Plastics Mechanical Fasteners Thermal bonding Press Fitting. Testing of plastic

Text Books:

- Plastics Extrusion technology1988 F.Hensen, Publishers
- Polymer extrusion1990C.Rauwendaal, Hanser Publishers
- Manufacturing Engineering & Technology6st Edition (2013) S Kalpakjian & SR Schmid Pearson Education Canada Machining of Plastics1981Akira Kobyashi,McGraw Hil

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME221T **Course : Finite Element Analysis**

L:3 Hrs. P:0 Hrs. Per week **Credits:3**

Course Objectives:

To understand methods of analysis in depth and study comparison of separation of variables, Laplace transformation, Rayleigh Reitz method, Galerkin's method, minimum potential energy, principle of virtual displacement, finite element method and finite difference method. To study some of the elements, selection of number of elements, convergence criterion, boundary conditions and its significance. To explore applications of FEA in various fields. To understand various FEA softwares.

Expected Outcomes:

At the end students will be able to understand individual element stiffness matrix, shape functions, general procedural for solving problems of finite element analysis, method of analysis, various types of elements, applying FEA techniques in various fields like solid mechanics, heat transfer, vibration etc. To describe given object into number of elements, selection of type of element, decide the boundary condition and to determine nodal displacement, element stresses, element strain, support reactions etc.

Syllabus:

UNIT-I

General Concept Introduction, the finite element method advantages and disadvantages, history of development, relevance, scope and engineering application – review of basic concepts of elasticity, principle of minimum potential energy, principle of virtual displacements.

UNIT-II

Variational and Weighted Residual Formulations: Boundary value problems, approximate method of solution, review of variational calculus, the Euler-lagrange equations, geometric and natural boundary conditions, method of weighted residuals. Raleigh Ritz and Galerkin methods –finite element formulations – comparisons through simple examples – the finite element basis, displacement models, convergence criteria.

UNIT-III

Elements Shape Function: Parameters functions , one dimensional elements ,global coordinates, natural co-ordinates, two dimensional elements, three noded triangular and four noded quadrilateral elements, three dimensional elements, four noded tetrahedral element.

UNIT-IV

Isoparametric Element Formulation: Isoparametric elements, characteristics, formulations and shape functions for one dimensional, two dimensional and three dimensional elements, numerical quadrate formulae, Jacobean matrices and transformations.

UNIT-V

Problem in Solid Mechanics: Formulation of the problems of axial, torsional and flexural deformations of beams, plane stress, plane strain and axis symmetric problemsfree vibration of beam and shafts.

Tutorial: Based on above syllabus.

References :

1. Reddy J.N. An introduction to the finite element method McGraw Hill Book Co.1984.
2. Larry J. Segerlind, Applied finite element analysis, John Willey, 1984.
3. Krishnamurthy , C. S., finite element analysis : Theory and programming , Tata Mc Graw Hill Publishing Co. , 1987.
4. Zienkiewiez , O. C. the finite element method, Tata Mc Graw Hill Publishing co. 1979.
5. M. Petyt, Introduction to finite element vibration analysis, Cambridge University Press, Cambridg, 1990.
6. Gowri Dhatt and Gilbert Touzot, The finite element method displayed ,Jhon Willey and Sons, 1985.
7. Hubner, K. H. and E . A. Thornton , the finite element method for engineers, Jhon Willey and sons,1982.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME222T Course : Optimization In Engineering Design Course Objectives

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

The study of optimization is concerned with understanding of optimality of various design parameters for any system.It includes maximization or minimization of any designparameters or any affecting parameters concerned with practical industrial mechanical system. The overall objective of this course is to learn and understand principals of optimization techniques for various mechanical Engg. problems .This course includes conceptual and practical approach of optimization to mechanical field, introduction of various optimization techniques for varied condition of contained and unconstrained system, design of loaded members, design of shaft, beam for minimum cost & maximum power, optimum design of single, two DOF system optimum design of structural members under dynamics loads.

Expected Outcomes:

Students will able to understand the concepts of optimization along with its various methods of implementations for practical problem.

Syllabus:

UNIT-I

Introduction : General characteristics of mechanical elements, adequate & optimum design, principles of optimization, formulation of objective function, Design constraints.

UNIT-II

Optimization Techniques : Unconstrained minimization methods single multivariable search methods, random, pattern gradient search techniques, minimization procedure with equality and inequality constraints, penalty functions, concept of multicriterion Optimization.

UNIT-III

Application to Mechanical Engg. Problems : Design of simple axial transverse loaded members for torsionaly loaded members, shafts for minimum cost weight maximum power,

UNIT-IV

Design of springs hydraulic cylinders, optimum design of single two degree of freedom system,

UNIT-V

vibration absorbers optimum design of simple machine/structural members under dynamic loads, multicriterion optimization of machine tools spindles .

Tutorial: Based on above syllabus.

Reference :

1.Rao S.S. optimization Theory & Applications, Wiley Eastern Limited,New Delhi , 1978.
2.Fox Richard L.Optimizations methods for Engg. design, Addision Wesley ,1971 .
3.Haug,E.J.and Arora, J.S. Applied optimal design Wiley Inter Science Publication ,New York ,1979
4.Douglas J. Willde, Globally optimal design Jhon Wiley & Sons, New York, 1978
5.Johnson Ray C. optimum design of mechanical elements, John Wiley & Sons 1981.
6.Mischke, Charles R., An introduction to Computer Aided Design, Prentice Hall Inc ,1968

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME223T Course : Rapid Prototyping

L:3 Hrs. P:0 Hrs. Per week Credits:3

Objective

To learn the Product Life Cycle. Study the process of Rapid prototyping and different Rapid Prototyping methods

Course Outcome

Student will learn basics of Rapid Prototyping the process of RP model slicing for RP Liquid and solid based RP systems powder based RP system tooling and manufacturing

UNIT I

CAD CAM and its integration, Development of CAD CAM., The importance of being Rapid, The nature of RP/T, The state of RP/T industry. Rapid Prototyping Defined. Time compression Technologies, Product development and its relationship with rapid prototyping.

UNIT II

Data Preparation (Preprocessing), Part Building, Post Processing. CAD Model Preparation, Reverse Engineering and CAD model, Digitizing Techniques: Mechanical Contact Digitizing, Optical Non contact Measurement, CT Scanning Method, Data Processing for Surface Reconstruction.Data interface for Rapid Prototyping: STL interface Specification, STL data generation, STL data Manipulation, Advantages and limitations of STL file format. Open files. Repair of STL files. Alternative RP interfaces.Part orientation and support generation Factors affecting part orientation, various models for part orientation determination, the function of part supports, support structure design, Automatic support structure generation.

UNIT III

Model slicing and skin contour determination, Identification of external and internal contours, Contour data organization, Direct and adaptive slicing: Identification of peak features, Adaptive layer thickness determination, Skin contour computation. Tool path generation.Part Building Recoating, parameters affecting part building time, part quality.Post Processing Part removal, finishing, curing.Other issues: Shrinkage, Swelling, Curl and distortion, Surface Deviation and accuracy, Build Style Decisions,

UNIT IV

Classification, Description of RP Machines: SLA, SLS, FDM, 3D Printing, LOM, SDM, Contour Crafting

UNIT V

Classification of RT Routes, RP of Patterns, Indirect RT: Indirect method for Soft and Bridge Tooling, Indirect method for Production Tooling, Direct RT: Direct RT method for Soft and Bridge Tooling, Direct method for Production Tooling, Other RT Approaches. Rapid Manufacturing: Methods, limitations.

BOOKS RECOMMENDED

1 Bjorke, Layer Manufacturing, Tapir Publisher. 1992.
2 Jacobs, PF (Ed), Rapid Prototyping and Manufacturing, Society of Manuf. Engrs, 1992.
3 Burns, M., Automated Fabrication: Improving Productivity in Manufacturing, 1993.
4 Jacobs, P.F. (Ed.), Stereo lithography and Other RP&M Technologies: From Rapid Prototyping to Rapid Tooling, Society of Manuf. Engrs. NY, 1996.
5 Chua C. k. and L. K. Fai, Rapid Prototyping: Principles and Applications in Manufacturing.
6Gibson, I. (Ed.), Software Solutions for Rapid Prototyping, Professional Engineering Publications, London., 2002

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME231A Course : PEDAGOGY STUDIES

L:2 Hrs. P:0 Hrs. Per week Credits:

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy

making undertaken by the DfID, other agencies and researchers.

2.Identify critical evidence gaps to guide the development.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in

developing countries?

2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

3. How can teacher education (curriculum and practicum) and the school curriculum and guidance

materials best support effective pedagogy?

Syllabus

UNIT I: Introduction and Methodology:

Aims and rationale, Policy background, Conceptual framework and terminology

Theories of learning, Curriculum, Teacher education.

Conceptual framework, Research questions.

Overview of methodology and Searching.

UNIT II: **Thematic overview:** Pedagogical practices are being used by teachers in

formal and informal classrooms in developing countries.

UNIT III: Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices

Methodology for the in depth stage: quality assessment of included studies.

How can teacher education (curriculum and practicum) and the school

curriculum and guidance materials best support effective pedagogy?

Theory of change.

Strength and nature of the body of evidence for effective pedagogical practices.

Pedagogic theory and pedagogical approaches.

Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV:

Professional development: alignment with classroom practices and follow-up support

Peer support

Support from the head teacher and the community.

Curriculum and assessment

Barriers to learning: limited resources and large class sizes

UNIT V: Research gaps and future directions

Research design

Contexts

Pedagogy

Teacher education

Curriculum and assessment

Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME232A Course : STRESS MANAGEMENT BY YOGA

L:2 Hrs. P:0 Hrs. Per week Credits:

Course Objectives:

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Syllabus

UNIT I : Definitions of Eight parts of yog. (Ashtanga)

UNIT II: Yam and Niyam.

Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III : Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii)Regularization of breathing techniques and its effects-Types

of pranayam

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur

Model Curriculum of Engineering & Technology PG Courses [Volume-I]

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama

(Publication Department), Kolkata.

SYLLABUS OF SEMESTER II, M. TECH. (MED)

Course Code: 23PME233A Course: Personality Development Through Life Enlightenment Skills

L:2 Hrs. P:0 Hrs. Per week Credits:

Course Objectives:

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes:

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

Syllabus

UNIT I: Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom)

Verses- 29,31,32 (pride & heroism)

Verses- 26,28,63,65 (virtue)

Verses- 52,53,59 (dont's)

Verses- 71,73,75,78 (do's)

UNIT II: Approach to day to day work and duties.

Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,

Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,

Chapter 18-Verses 45, 46, 48.

UNIT III: Statements of basic knowledge.

Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad BhagwadGeeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39

Chapter18 – Verses 37,38,63

Suggested reading

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication
2. Department), Kolkata

3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,

4. Rashtriya Sanskrit Sansthanam, New Delhi.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME301P Course : Project- Phase-I

L:0 Hrs. P:16 Hrs. Per week Credits:8

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME311T Course : Design of Mechanical Handling System

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

The study of Design of various Mechanical handling system is concerned with understanding of various industrial system and devices with its basic design. It includes various based use in practical design field. The overall objectives of this course is to understand and learn about various industrial mechanical handling devices starting from their basic design for any desired condition and its safety analysis with its theoretical knowledge. This curse includes designed considerations of conveying mechanics like trucks, trolleys, Rope ways, Cranes, Elevators, Draglines, Robotics handling, Belt conveyers, Chain conveyers, screw conveyers, pneumatic conveying system.

Expected Outcomes:

Students will able to understand the practical basic design of various material handling systems for various loading conditions along with various material loading conditions.

Syllabus:

1. Constructional features, operation, operational characteristics advantages Disadvantages, limitations,
2. Design considerations of following conveying machines.
3. Unit Load conveying: Fork lift Trucks, Trolley, conveyers. Cableways, Rope ways, Cranes , Over head cranes
4. Elevators, Drag lines , Robotic Handling , AGV Bulk solid us conveying: Belt conveyers , chain conveyers, Roller conveyers, (Gravity & Powered)
5. Screw conveyers, Tubular screw conveyers, Escalators, Vibrating conveyers, (Crank type & spring type), Pneumatic conveying.

Tutorial: - Based on above syllabus.

References:

1. Aleczandow : –Materials Handling**II**, MIR Publ.
2. Acma, Reference book for Belt conveyers .
3. Conveyaing Machings –, by CITADINOV, MIR publ.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME312T Course : Vibration based condition Monitoring

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

To understand vibration from basics to advanced level by diagnosis of problem using spectrum. To gain the knowledge in the coupling its types and application diff rent alignment techniques and latest trends in alignment

Expected Outcomes:

Students will able to understand various problems occurring in machines and their Diagnosis.

Syllabus:

I Vibration Instrumentation: Displacement, Velocity, Acceletation Shock Measurement, Transducers, Terminatings devices

II spectrum Analyzers , Exciters, Special Mounting Techniques .

III Signature Analysis : Concept of signature & prediction of trouble by signature monitoring , signatures due to imbalance,

IV coupling ,bearing, electric motor, gear drive , beltdrive , chain drive., PIV drive, piping .

V Effect of special phenomena : Bent shaft / Bowed Rotor , Transmitted vibrations, sympathetic vibration, impact , shock. Trend analysis, Approach for Diagnostics .

References :

1. W. Wowak , " Machinery Vibrations", Mc-Graw, Hill
2.Kolacoat ," Vibration Based Condition Monitoring", Prentice – Hall.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME313T Course : Modelling & Simulation

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives: The course aims to develop the engineering analysis capability for engg problems using basic statistical tools and techniques. Detailed treatment of various modeling techniques leading to complete understanding and simulation the processes including its optimization is envisaged in this course.

Course Outcomes: Students are able to design the electronic and informatic means to implement them on control systems.

Unit 1

Introduction to mathematical modeling, Need, Advantages, Limitations, Disadvantages & Applicable to mechanical, manufacturing, process, Automotive,Electrical & Control System, Software tools available for modeling [Matlab Simulink, AutoLISP, ADAMS/Pro-Mechanica/ Visual Nastran/Working Model 4D, MathCAD/ Mathematica, Lab View and computer languages[C/C++/ Fortran /AutoLISP/ Simula /SIMSCRIPT/GASP/GPSS] for mathematical modelling.

UNIT 2

Introduction to automatic controls. Modeling of general second order system(mechanical systems [spring, mass, damper], flow, heat transfer and electrical, pneumatic and vibration systems). Block diagram and transfer function, Modeling of continuous system, Extraction of reduced order models. Transient and frequency response evaluation using Laplace transform, Control loop and its elements, Dynamic behaviour of first, second and higher order physical systems. Linearization of nonlinear systems. Controller hardware, sensors, transmitters and control valves

UNIT 3

Characteristics of hydraulic controller, pneumatic, electronic controller, electro hydraulic and electro pneumatic controllers, PID control, Stability, Gain and phase margins, Control system design using root and compensation

UNIT 4

Simulation Introduction, Advantages, Limitations, Disadvantages, Concept of System, Process, Activity, Attributes, Closed & Open System, Activities: Deterministic & Stochastic, Models: Static, Dynamic, Transient, Simulation Approaches: Event Scheduling, Process Interaction, Activity Scanning, Steps in Simulation Study

UNIT 5

Instrumentation and Process Control-Introduction, Study of various measuring parameters of a process/system and Measuring instruments for: Temperature, pressure, level, flow, Control schemes with applications to Machine tool,Boiler, Engine Governing, Aerospace, Active vibration control, Manufacturing, Process control, etc.

Text Books:

1. S.R Bhonsale, K.J., "Mathematical modeling for design of machine components", Weinmann, 1999, Prentice Hall.
2. A.F. D'souza V K Gar, "Englewood Cliffs Advanced Dynamics: Modelling and Analysis," N. J., Prentice Hall, 1984
3. Averal M. Law, W. David Kelton, "Simulation, Modelling and analysis", McGraw Hill, 1992.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME321T Course : Business Analytics

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course objectives:

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Mange business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcomes:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT I:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT II:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.

Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT III:

Organization Structures of Business analytics, Team management,Management Issues, Designing Information Policy, Outsourcing,Ensuring Data Quality, Measuring contribution of Business analytics,Managing Changes.Descriptive Analytics, predictive analytics, predicative Modelling,Predictive analytics analysis, Data Mining, Data Mining Methodologies,Prescriptive analytics and its step in the business analytics Process,Prescriptive Modelling, nonlinear Optimization.

UNIT IV:

Forecasting Techniques: Qualitative and Judgmental Forecasting,Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend,Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, News vendor Model, Overbooking Model, Cash Budget Model.

UNIT V:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

UNIT VI:

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2.Business Analytics by James Evans, persons Education.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME322T Course : Industrial Safety

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

1.To know about Industrial safety programs and toxicology ,Industrial laws , regulations and source models.

2.To understand about fire and explosion, preventive methods, relief and its sizing methods

3.To analyse industrial hazards and its risk assessment.

Course Outcomes:

By the end of the course the students will be able to

1.Analyze the effect of release of toxic substances

2.Understand the industrial laws, regulations and source models.

3.Apply the methods of prevention of fire and explosions.

4.Understand the relief and its sizing methods

5.Understand the methods of hazard identification and preventive measures.

UNIT-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition,

principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V: Periodic and preventive maintenance: Periodic inspection-concept and need,degreasing, cleaning and repairing schemes, overhauling of mechanical components,overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

SYLLABUS OF SEMESTER III, M. TECH. (MED)

Course Code: 23PME323T Course : Operations Research

L:3 Hrs. P:0 Hrs. Per week Credits:3

Course Objectives:

1.To make the students aware with quantitative tools and techniques, which are frequently applied to business decision-making.

2.to provide a formal quantitative approach.

3.To problem solving and an intuition about situations where such an approach is appropriate.

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

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.

2. Students should able to apply the concept of non-linear programming

3. Students should able to carry out sensitivity analysis

4. Student should able to model the real world problem and simulate it.

Syllabus Contents:

UNIT I:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT II:

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT III:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT IV:

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V:

Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008

2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009

5. Pannerselvam, Operations Research: Prentice Hall of India 2010

6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

SYLLABUS OF SEMESTER IV, M. TECH. (MED)

Course Code: 23PME401P Course : Project- Phase-II

L:0 Hrs. P:32 Hrs. Per week Credits:16

Student should publish at least two research papers in National/ International journals on project spade work and research.