MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech. (Mechanical Engineering)
Semester VI

Syllabus

DUGC Convener | Curriculum Committee Convener | SUGB Chairman

Date:

UG/PG : UG	Department: Mechanical Engineering
Course Code: MET-322	Course Name: Computer Integrated Manufacturing
Credit: 3	L-T-P: 2-1-0

Syllabus

Introduction

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

Components of CIM

Building blocks of flexible manufacturing system; Manufacturing Machines and their Design Consideration e.g. CNC Turn, CNC Mill etc., Pallet, CMM, Measuring Probes, Robots, Job Loading & Unloading Arm, Work Transfer stations, Assembly Stations, Automated Storage Retrieved System (ASRS), Material Handling Systems: Automated Guided Vehicles (AGV), Conveyers, Computer Control System. Mechatronics: Sensors, Actuators, Convertors, Modular Automation.

Shop Floor Control & Integration of Components

Shop floor control-phases -factory data collection system -automatic identification methods- Bar code & RFID technology-automated data collection system, Integration of manufacturing & business functions.

Books:

1. Nanua Singh "Systems Approach to Computer Integrated Design and Manufacturing" John Wiley & Sons, Inc
2. Mikell.P.Groover "Automation, Production Systems and computer integrated manufacturing", Pearson Education 2001.
3. Nand K. Jha "Hand-book of Flexible Manufacturing Systems" Academic Press, 1991
4. Yoremkoren, "Computer Integrated Manufacturing System", McGraw-Hill, 1983.
5. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International, 1986.
6. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe "Computer Integrated Design and Manufacturing", McGrw-Hill.
7. Roger Hanman "Computer Intergrated Manufacturing", Addison – Wesley, 1997.

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Date:

UG	Department: Mechanical Engineering
Course Code: MET-323	Course Name: Product Design and Development
Credit: 3	L-T-P: 2-1-0

Syllabus

Introduction, Product Development Process and Product Planning, Product life cycle concept, Product Specification Development, Product Architecture, Conceptual Design, Industrial Design, Design for Manufacturing and Assembly, Design for Environment, Robust Design, Physical Prototypes and Models and Experimentation, Human factors in design, Product Development Economics, Patents and Intellectual Properties

Books

1. Kevin Otto and Kristin Wood, "Product Design: Techniques in Reverse Engineering and New Product Development", 1/e, 2004, Pearson Education, New Delhi
2. Karl T. Ulrich and Steven D. Eppinger, "Product Design and Development", Tata McGraw-Hill Edition, New Delhi, 2003
3. David G. Ullman, "The Mechanical Design Process", McGraw-Hill Inc., Singapore, 1992

UG/PG : UG	Department: Mechanical Engineering

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Date:

Course Code: MET-324	Course Name:Advanced Manufacturing Processes
Credit: 3	L-T-P: 2-1-0
Pre-requisite course: Conventional Mfg. Processes & Material Science.	

Syllabus

UNIT I

Advanced Machining Processes: Classification of Advanced Machining Process. MECHANICAL ENERGY BASED PROCESSES: AJM, WJM, AWJM and USM- Working Principles, Equipment, Process parameters, Applications. ELECTRICAL ENERGY BASED PROCESSES: EDM & WEDM - Working Principles, Equipment, Process parameters, Applications. CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES: CHM and ECM Working Principles, Equipment, Process parameters, Applications. THERMAL ENERGY BASED PROCESSES: LBM, PAM, EBM- Working Principles, Equipment, Process parameters, Applications.

UNIT II

Advanced Casting Processes: Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting.

UNIT III

Advanced Welding Processes: Electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW).

UNIT IV

Advanced Metal Forming Processes: Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming

UNIT V

Additive Manufacturing: FDM, SLS, 3 DP, LOM etc.

Books:

1. "Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York.
2. “Advanced Machining Processes” Vijay.K. Jain, Allied Publishers Pvt. Ltd., New Delhi.
3. “Manufacturing Engineering & Technology”, Kalpakjian. S., Pearson Education Asia.
4. "Materials and Processes in Manufacturing", E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi
5. “Material and Processes in manufacturing” Paul De Garmo, J.T.Black, and Ronald.A.Kohser, Prentice Hall of India Pvt. Ltd., New Delhi.

UG	Department: Mechanical Engg.

DUGC Convener Curriculum Committee Convener SUGB Chairman

Date:

Course Code: MET-325	Course Name: Refrigeration and Air Conditioning
Credit: 3	L-T-P: 2-1-0
Pre-requisite course: Engg. Thermodynamics, Fluid Mechanics and Machines, Heat Transfer	

Syllabus

Air refrigeration cycles- Reverse Carnot cycle, Bell Coleman air cycle, Actual cycle and its application in air-crafts air conditioning, performance and comparison, heat pump cycle.

Vapour compression refrigeration- Ideal and actual cycle, cycle analysis, factors affecting its performance, Different refrigerants and their applications. Multi stage compression, use of flash gas removal and flash inter cooling, cascade systems.

Vapour absorption refrigeration-Cycle, components and performance

Psychrometry- Properties, charts and its uses, processes, air washer, evaporative cooling and air cleaners.

Air conditioning- Winter and summer air conditioning system and their analysis, human comfort and comfort charts, duct losses and ducting system, air distribution and methods of duct design

Solar radiation- Distribution of solar radiation, earth-sun angles and their relationship, direct and diffuse radiation on a surface, heat gain through glass, shading devices, heat transfer through building structure, passive heating and cooling of building.

Load estimation- heating/cooling load components, infiltration, air changes, load calculation.

Books:

1. Stoecker, W.F., and Jones, J.W., "Elementary Refrigeration and Air conditioning", McGraw-Hill
2. Dosset, R.J., "Principles of Refrigeration", Pearson Education
3. Arora, C.P., "Refrigeration and Air conditioning", Tata-McGraw-Hill
4. Prasad, M., "Refrigeration and Air Conditioning", New Age International
5. ASHRAE Handbook (Fundamentals) 2005

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Date:

UG	Department: Mechanical Engineering
Course Code: MET-326	Course Name: Total Quality Management
Credit: 3	L-T-P: 2-1-0

Syllabus

Definition, History, Framework and Benefits of TQM, Characteristic and roles of a successful quality leader, Voice of customer and retention of customer, Employee involvement, teamwork, performance appraisal and rewards, Juran Trilogy, PDSA, Kaizen, Six-sigma, Selection, certification and rating of suppliers, Quality costs, Malcolm Baldrige National Quality Award, benchmarking, Spider chart and comparison with competitors products, ISO 9000+ certifications, quality audits, Quality Management Systems, ISO14000+ certifications, Environmental Management System, Voice of customer, house of quality, Quality Function Deployment, Rationale and methods Quality by Design, Methodology and documentation, Failure Mode and Effect Analysis, Liability laws and defense, Products Liability, Affinity diagram, interrelations digraph, tree and matrix diagrams, Management Tools, Charts and techniques for statistical process control, Statistical Process Control

Reference Books

1. Besterfield, Dale H., Total Quality Management, Pearson Education, 3rd Revised Edition, 2011.
2. Sharma D.D., Total Quality Management, Principles, Implementation & Cases, Sultan Chand & Sons, New Delhi, 2000
3. James R. Evans, Total Quality Management, Organization, and Strategy, Thomson, 4th Ed., 2007.
4. Besterfield, D.H., Quality Control, Pearson, 7th Ed., 2004.

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Date:

UG/PG: UG	Department: ME
Course Code: MET- 327	Course Name: Optimization Methods in Engineering Design
Credit: 3	L-T-P: 3-0-0
Pre-requisite course: A course on Matrix Methods and numerical methods	

Syllabus

Introduction

General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of objective function, design constraints -Classification of optimization problems.

Optimization techniques

Single variable and multivariable optimization, Techniques of unconstrained minimization - Golden Section -Random , pattern and gradient search methods -Interpolation methods; Optimization with equality and inequality constraints - Direct methods - Indirect methods using penalty functions Lagrange multipliers; Geometric programming and stochastic programming; Multi objective optimization, Genetic algorithms and Simulated Annealing techniques.

Engineering applications

Structural applications - Design of simple truss members. Design application - design of simple axial, transverse loaded members for minimum cost , maximum weight, - Design of shafts and torsionally loaded members -Design of springs, Dynamic Applications - Optimum design of single, two degree freedom system, vibration absorbers. Application in Mechanism - Optimum design of simple linkage mechanism.

Text Books:

1. Jasbir. Arora , Introduction to optimum Design, Elsevier
2. Singeresu S. Rao, "Engineering Optimization - Theory and Practice" New Age Intl. Ltd., Publishers, 2000.
3. References:
4. Johnson Ray, C., "Optimum design of mechanical elements" , Wiley , John & Sons, 1981.
5. Goldberg, D.E., "Genetic algorithms in search, optimization and machine", Barnen, Addison-Wesley, NewYork, 1989.
6. 3. Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples", PHI India,199

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Date:

UG/PG: UG	Department: Mechanical Engineering
Course Code: MEP-328	Course Name: Modeling and Simulation Lab
Credit: 1	L-T-P:0-0-2

Syllabus

Introduction to Simulation and Modeling, Manual Simulation of Systems, Discrete Event Formalisms, Statistical Models in Simulation, Queuing Models, Random Number Generation, Random Variate Generation, Input Modeling, Verification and Validation of Simulation Model, Output Analysis, Case Studies

Reference Books

1. Banks J., Carson J. S., Nelson B. L., and Nicol D. M., Discrete Event System Simulationî, 3rd edition, Pearson Education, 2001.
2. Gordon Geoffrey, System Simulationî, 2nd edition, PHI, 1978.
3. Law A. M., and Kelton, W. D., Simulation Modeling and Analysis, 3rd edition, McGraw-Hill, 2000.

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Date:

UG/PG: UG	Department: ME
Course Code: MEP-329	Course Name: Mechanical Vibrations Lab
Credit: 1	L-T-P: 0-0-2

Syllabus

1. To find the natural frequencies of the box supported on four springs experimentally and verify the same analytically.
2. Study of coupled and uncoupled pitching and bouncing motion of two degrees of freedom system.
3. To determine the harmonic components of vibrations of a compressor bed.
4. Study of vibrations of a free beam.
5. Mass coupled system.
6. Forced vibration of a one dimensional system with damping.
7. Three rotor system.
8. Estimation of internal damping by regression analysis.
9. Free and forced vibration using universal vibration machine.
10. Beat motion in a two pendulum system.
11. Study of whirling phenomenon in a shaft.
12. Forced vibration in a fixed-fixed horizontal flat beam.

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