CAD/CAM & Robotics

Contact Hours/ Week	: 03	Credits :	3.0
Total Lecture Hours	: 39	CIE Marks :	50
Total Tutorial Hours	: 00	SEE Marks :	100
Sub. Code	: ME52		

Module-I

Definition of CAD/CAM, product life cycle, Role of computers in design and manufacturing., Introduction to CAD and CAM. Advantages and disadvantages of CAD and CAM. Basic Hardware structure, Design workstation, CPU, memory types, input devices, display devices, hard copy devices and storage devices. 09 Hrs

Module-II

Software configuration of a graphic system, function of graphics' package construction of geometry, wire frame and solid modeling, CAD/CAM integration. Desirable modeling facilities, 2D transformations. Introduction to exchange of modeling data -Basic features of IGES, STEP, DXF, and DMIS. 09 Hrs

Module-III

NC, CNC, DNC, modes, NC elements, advantages and limitations of NC, CNC. Functions of computer in DNC. Turning tool geometry, milling tooling system, tool presetting, ATC, work holding devices.

07Hrs

Module-IV

Overview of different CNC machining centers, CNC turning centers, high-speed machine tools, machine control unit. Part program fundamentals-steps involved in development of a part program.

07 Hrs

Module-V

Manual part programming, drilling, milling, turning, programming. Introduction to robotics, robot configuration, robot motion, programming of robots, end effectors, work cell, control and interlock, robot sensor, robot applications. 08Hrs

TEXT BOOK

1	CAD/CAM Principles and Application by P .N. Rao, Tata McGraw Hill.2002.
2	CAD/CAM Groover, Tata McGraw Hill.2003.

REFERENCE BOOKS

1	Mastering CAD/CAM by Ibrahim Zeid, Tat McGraw Hill, 2007.
2	Industrial Robotics by Groover,Weiss, Nagel, Odrey, McGraw Hill, 2005.

Design of Machine Elements-I

Contact Hours/ Week	: 04	Credits :	04
Total Lecture Hours	: 52	CIE Marks :	50
Total Tutorial Hours	: 00	SEE Marks :	100
Sub. Code	: ME53		

Module-I

Definition: Normal,shear,uniaxial,biaxial, triaxial stresses and tensors, prinicipal stresses, theories of failure:Maximum Normal stress theory,Maximum shear stress theory,Distortion Energy theory and problems on failure of ductile and brittle materials,Engineering materials and their mechanical properties and selection stress strain diagrams, design considerations and solutions to problems

Module-II

Design for static, fatigue and impact strength: Factor of safety, static loads, stresses. Stress concentration, stress concentration factor. S-N diagram, Endurance limit and its modifying factors, variable stresses, Soderberg's and Goodman's relationships, combined variable stresses. Impact loading and Impact stresses due to axial and bending loads with and without the effect of inertia and solution to problems.

Module-III

Design of Shafts: Shafts subjected to axial, bending and torsion, design for strength and rigidity with steady loading, ASME and BIS codes used in designing for transmission of power, shafts subjected to fluctuating and combined loads and solution to problems.

Module-IV

Riveted and welded joints: Rivet materials , failure of riveted joints, efficiency, boiler and structural joints. Riveted brackets and Eccentric loading. Welding joints: Types, Strength of butt and fillet welds. Eccentric loading of welded joints in bending, twisting and torsion and solution to problems.

Module-V

Power screws and Couplings: Stresses in power screws, self locking and efficiency. Complete design of power screw and screw jack. Couplings: Rigid and flexible couplings, Flange coupling, pin type flexible coupling and solution to problems.

Design Data Handbooks:

1	Design Data Handbook by K. Lingaiah, McGraw Hill 1983, Vol.1
2	Design Data Handbook by K. Mahadevan and Balaveera Reddy CBS publication.

TEXT BOOKS:

1	Mechanical Engineering Design by Joseph E Shigley and Charles R. Mischke Hill International Edition, 6th edition 2003.
2	Design of Machine Elements by V.B. Bhandari, Tata Mcgraw Hill Publishing company Ltd. New Delhi, 2nd edition 2007.

REFERENCE BOOKS:

1	Design of Machine Elements by M.F. Spotts, T.E Shoup, L.E. Hornberger, S.R. Jayaram and C.V. Venkatesh, Pearson Education 2006.
2	Machine Design by Hall, Holowenko and Laughlia (Schaum's Outline series) adapted by S.K. Somani Tata Mcgraw Hill Publishing company Ltd. New Delhi, Special Indian Edition 2008.
3	Design of Machine Elements Maleev and Hartman . Ed 4. New Delhi. McGraw Hill.

TURBO MACHINERY

Contact Hours/ Week	: 03	Credits :	03
Total Lecture Hours	: 40	CIE Marks :	50
Total Tutorial Hours	: 00	SEE Marks :	100
Sub. Code	: ME54		

Module-I

Introduction: Definition of a turbo machine; Parts of a Turbo machine; Comparison with positive displacement machine; Classification of hydraulic turbines, discussions on various efficiencies of Pelton wheel, Francis turbines and Kaplan turbines. Problems concerned to these turbines.

7 hrs

Module-II

Energy Transfer in Turbo Machine: Euler Turbine equation; Alternate form of Euler turbine equation - components of energy transfer; Degree of reaction; General analysis of a turbo machine - effect of blade discharge angle on energy transfer and degree of reaction; General analysis of centrifugal pumps and compressors - Effect of blade discharge angle on performance; Theoretical head- capacity relationship; General analysis of axial flow compressors and pumps -general expression for degree of reaction; velocity triangles for different values of degree of reaction; General analysis of turbines - Utilization factor; Vane efficiency; Relation between utilization factor and degree of reaction; condition for maximum utilization factor -optimum blade speed ratio for different types of turbines.

10 hrs

Module-III

Steam and Gas Turbines: Impulse Staging and need for compounding; Velocity and pressure compounding- condition for maximum utilization factor for multi stage turbine with equiangular blades; Effects of Blade and Nozzle losses; Reaction staging; Reheat factor in turbine

8 hrs

Module-IV

Centrifugal Compressors and Pumps: Centrifugal Compressors- Classification; Expression for overall) pressure ratio developed; Blade angles at impeller eye root and eye tip; Slip factor and power input factor; Width of the impeller channel; Compressibility effects-need for pre-whirl vanes; Diffuser design:- Flow in the vane less space, determination of diffuser inlet vane angle, width and length of the diffuser passages; Surging of centrifugal compressors; Centrifugal Pumps:- definition of terms used in the design of centrifugal pumps like manometric head, suction head, delivery head, manometric efficiency, hydraulic efficiency, volumetric efficiency, overall efficiency, multistage centrifugal pumps design procedure.

8 hrs

Module-V

Axial Flow Compressors: Classification; Expression for Pressure t ratio developed per stage- work done factor, radial equilibrium conditions, Determination of air angle distribution with respect to blade height using free vortex flow theory and constant reaction theory; Blade design procedure using single air foil theory and cascade theory (No problems on blade design); 6Hrs

TEXT BOOKS:

1	An Introduction to energy conversion by Volume III- Turbo machinery, V.Kadambi and Manohar Prasad, Wiley Eastern Ltd. (1977).
2	"Turbines, Compressors & Fans", by S.M. Yahya, Tata-McGraw Hill Co., 2nd Edition (2002).

REFERENCE BOOKS:

1	"Principles of Turbo Machinery", D.G.Shepherd, The Macmillan Company (1964).
2	"Gas Turbines", by V.Ganesan, Tata McGraw-Hill Company Limited 2nd Edition (2002).

AUTOMATIC CONTROL ENGINEERING

Contact Hours/ Week	: 3 hrs	Credits :	3
Total Lecture Hours	:	CIE Marks :	50
Total Tutorial Hours	:	SEE Marks :	
Sub. Code	: ME55		

Module-I

INTRODUCTION: Concepts of automatic controls, open and closed loop systems, concepts of feedback. Requirement of an ideal control system.

Types of controllers: Proportional, Integral, Proportional Integral, Proportional Integral Differential controllers (Basic concepts only). Transfer function for Mechanical Systems having translational motion.

08 hrs

Module-II

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, block representation of system elements, reduction of block diagrams.

Signal flow graphs: Mason's gain formula.

08 hrs

Module-III

TRANSIENT AND STEADY STATE RESPONSE ANALYSIS:

Introduction, First order and second order system response to step, ramp and Impulse inputs, Transient response specifications.(No derivation).

System stability- Routh's-Hurwitz Criterion.

09 hrs

Module-IV

FREQUENCY RESPONSE ANALYSIS USING BODE PLOTS:

Introduction to polar plots and nyquist plots.

Bode attenuation diagrams, Stability Analysis using Bode plots,Simplified Bode Diagrams.

10 hrs

Module-V

ROOT LOCUS PLOTS:

Definition of root loci,general rules for constructing root loci, Analysis using root locus plots.

SYSTEM COMPENSATION:

Series and feedback Compensation, Physical devices for system compensation.
(Basic concepts only). 10 hrs

TEXT BOOKS:

1	Modern Control Engineering	K. Ogatta. Pearson education, 2003.
2	Control Systems principles and design	M.Gopal, TMH, 2000.

REFERENCE BOOKS

1	Feedback Control Systems	Schaum's series 2001.
2	Control Systems	I.J.Nagarath & M.Gopal, New age International Publishers 2002.

Manufacturing process II

Contact Hours/ Week	: 03	Credits :	3.0
Total Lecture Hours	: 39	CIE Marks :	50
Total Tutorial Hours	: 00	SEE Marks :	100
Sub. Code	: ME56		

Module-I

Non traditional Machining process, Type of Processes, EDM, USM, AJM, EBM, LBM principle of operation, equipment, application, limitations and calculations of their parameters. 7 hrs

Module-II

Grinding m\cs, Bonding process, designation and selection of the grinding wheels, constructional features of surface grinding, balancing of grinding wheels. Super finishing process, honing, Lapping and super finishing. 7 hrs

Module-III

Rolling, classifications, Types of rolling mills, Roll Separating force, Frictional losses in rolling, defects in rolled products. Drawing of rods, wires and tubes, optional cane angle and dead zone formation. Extrusion, types of extrusion process, extrusion equipment dies, Defects in extrusion, Extrusion seamless pipes and tubes. 7 hrs

Module-IV

Deep drawing, principle stresses and deformation. Die and punch design parameter. Total punch load, limiting drawing ratios, Effects of anisotropy on LDR, forming limit criteria, Defects in deep drawn products, High energy rate forming methods, principles, advantages and application, Explosive forming, Electro hydraulic forming, Electromagnetic forming. 8 hrs

Module-V

Sheet metal forming, forming methods, Equipments for sheet metal forming, super plastic forming, design considerations, dies and punches, progressive and compound dies, combination die, rubber forming. 7 hrs

TEXT BOOKS:

1	Elements of workshop Technology, S.K. Hazra and Choudhary Vol. II, 1992
2	Manufacturing Process for Engineering Materials, Serope Kalpakjian and Steven R schmid, Pearson Education, Fourth edition 2007.

REFERENCE BOOKS

1.	HMT "Production Technology", Tata McGraw Hill 1994.
2.	Production Technology by R.K. Jain. Khanna publishers, 12th editions 2007.

FLUID MECHANICS & MACHINERY LABORATORY

Lab Hours/ Week	: 03	Credits :	1.5
Sub. Code	: MEL51	CIE Marks :	50
		SEE Marks :	50

Part A

1. Determination of coefficient of friction of flow in a pipe.
2. Determination of minor losses in flow through pipes.
3. Determination of force developed by impact of jets on vanes
4. Calibration of flow measuring devices
   (i) Orifice plate
   (ii) Flow nozzle
   (iii) Venturi meter
   (iv) Rotameter
   (v) V notch

18 hrs

Part - B

5. Performance testing of Turbines
   i. Pelton wheel
   ii. Francis Turbine
   iii. Kalpan Turbine

6. Performance testing of pumps
   i. Single stage and Multi stage centrifugal pumps
   ii. Reciprocating pump

7. Performance test of a two stage Reciprocating Air compressor
8. Performance test on Air Blower

24 Hrs

Scheme of Examination:

One Question from Part A :		15 Marks
One Question from Part A :		25 Marks
Viva voce	:	10 Marks
Total	:	50 Marks

MACHINE SHOP

Sub Code: MEL509 CIE Marks : 50
Hrs/Week : 03 SEE Hours :50
Exam Marks :50

PART –A

1 a) Types of lathe, Lathe specification & tools used on lathe
1 b) Study of Lathe accessories & attachments
1 c) Measuring & Marking instruments
1 d) Demonstartion of Capstan Lathe
1 e) Machining on lathe: The following operations are to be performed

i) Facing
ii) Countersinking
iii) Plain Turning
iv) Step Turning
v) Forming (Convex & Concave)
vi) Chamfering
vii) Taper turning by swiveling of compound rest method & Tail stock off-set method
viii) Thread cutting (V-Thread)
ix) Knurling
x) Eccentric Turning (Demonstration)

PART –B

2 a) Cutting V-groove/dovetail/rectangular groove using shapers
2 b) Spur gear teeth cutting on Horizontal milling machine

Scheme of Examination:

ii) One question should be set from Part-A covering any six different operations on lathe: Marks:30
iii) One question should be set from Part-B, either groove cutting or gear teeth cutting : Marks:10
iiii) Viva Voce : Marks:10

Total Marks :50

References:

1) Workshop Technology (Vol2) by Hajra Choudhury, S.K Bose
2) Production Technology by R.K. Jain