SCHEME OF TEACHING AND EXAMINATION
B.E. INDUSTRIAL & PRODUCTION ENGINEERING

V SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Theory	Practical	Duration (Hrs)	IA	Theory/ Practical	Total
1	06AL51	Management & Entrepreneurship	Engg/ Mngt	4	-	03	25	100	125
2	06IP 52	Control Engineering	IP	4	-	03	25	100	125
3	06IP 53	Theory of Metal Cutting	IP	4	-	03	25	100	125
4	06IP 54	Work Study and Ergonomics	IP	4	-	03	25	100	125
5	06IP/IM 55	CAD / CAM	IP/IM	4	-	03	25	100	125
6	06IP/IM 56	Design of Machine Elements	IP/IM	4	-	O3	25	100	125
7	06IPL 57	Mechanical Lab	IP	-	03	03	25	50	75
8	06IPL 58	Industrial Engineering Lab	IP	-	03	03	25	50	75
		TOTAL		24	06	24	200	700	900

SCHEME OF TEACHING AND EXAMINATION
B.E., INDUSTRIAL & PRODUCTION ENGINEERING

VI SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Theory	Practical	Duration (Hrs)	IA	Theory/ Practical	Total
1	06IP 61	Theory of Metal Forming	IP	4		O3	25	100	125
2	06IP/IM 62	Engineering Economy	IP/IM	4		03	25	100	125
3	06IP63	Tool Engineering & Design	IP	4		03	25	100	125
4	06IP/IM 64	Non Conventional Machining	IP/IM	4		03	25	100	125
5	06IP/IM 65	Quality Assurance & Reliability	IP/IM	4		03	25	100	125
6		**Elective-I (Group A)**	IP/IM	4		03	25	100	125
7	06IPL 67	CAD/CAM Lab	IP		03	03	25	50	75
8	06IPL 68	Machine Tools Lab	IP		03	03	25	50	75
		TOTAL		24	06	24	200	700	900

Elective-I (Group A)

06IP/IM 661	Value Engg. & Industrial Best Practice
06IP/IM 662	Mechanical Vibrations
06IP/IM 663	Finite Element Method
06IP/IM 664	Human Resource Management
06IP/IM 665	Software Engineering & Management
06IP 666	Advance Foundry Technology

SCHEME OF TEACHING AND EXAMINATION
B.E. INDUSTRIAL & PRODUCTION ENGINEERING

VII SEMESTER

| Sl. No | Subject Code | Title of the Subject | Teaching Dept. | Teaching Hours / week | | Examination | | | |
				Theory	Practical	Duration (Hrs)	IA	Theory/ Practical	Total
1	06IP/IM 71	Supply chain Management	IP/IM	4		O3	25	100	125
2	06IP 72	Mechatronics	IP	4		03	25	100	125
3	06IP/IM 73	Operations Management	IP/IM	4		03	25	100	125
4	06IP/IM 74	Operations Research	IP/IM	4		03	25	100	125
5		**Elective-II (Group B)**	IP/IM	4		03	25	100	125
6		**Elective-III (Group C)**	IP/IM	4		03	25	100	125
7	06IPL 77	Software Engg. Lab	IP	-	03	03	25	50	75
8	06IPL 78	CNC and Robotics Lab	IP	-	03	03	25	50	75
		TOTAL		24	06	24	200	700	900

Elective-II (Group B)

06IP   751   Simulation Modeling & Analysis
06IP/IM 752   Enterprise Resource planning
06IP/IM 753   Composite Materials
06IP/IM 754   Marketing Management
06IP/IM 755   Technology Management

Elective-III (Group C)

06IP/IM 761   Combinatorial Optimization
06IP/IM 762   Financial Management
06IP/IM 763   Project Management
06IP/IM 764   Concurrent Engg.
06IP/IM765   Facilities Planning and Design
06IP 766   Management Information system

SCHEME OF TEACHING AND EXAMINATION
B.E., INDUSTRIAL & PRODUCTION ENGINEERING

VIII SEMESTER

| Sl. No | Subject Code | Title of the Subject | Teaching Dept. | Teaching Hours / week | | Examination | | | |
				Theory	Practical	Duration (Hrs)	IA	Theory/ Practical	Total
1	06IP 81	Fluid Power Systems	IP	4	--	03	25	100	125
2	06IP/IM 82	World Class Manufacturing	IP/IM	4	--	03	25	100	125
3		**Elective-IV (Group D)**	IP/IM	4	--	03	25	100	125
4		**Elective-V (Group E)**	IP/IM	4	--	03	25	100	125
5	06IP 85	Project Work	IP	--	03	03	100	100	200
6	06IP 86	Seminar	IP	--	03	03	50	-	50
		TOTAL		16	06	24	250	500	750

Elective-IV (Group D)
06IP 831   Total Quality Management
06IP 832   Advanced Joining Processes & NDT
06IP/IM 833   Knowledge Management
06IP/IM 834   Design of Experiments
06IP/IM 835   Advanced Operations Research
06IP/IM 836   Data Base Management System

Elective-V (Group E)
06IP 841   Engineering System Design
06IP/IM 842   Artificial Intelligence & Expert Systems
06IP/IM 843   Just in Time Manufacturing
06IP/IM 844   Decision Support System
06IP/IM 845   Automation in Manufacture
06IP 846   Product Design & Manufacturing

V SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP

Subject Code	:	**06AL51**	IA Marks	: 25
No. of Lecture Hrs./ Week	:	04	Exam Hours	: 03
Total No. of Lecture Hrs.	:	52	Exam Marks	: 100

PART - A

MANAGEMENT

UNIT - 1
MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management – Management as a science, art or profession – Management and administration – Roles of management, Levels of management, development of management thought – early management approaches – modern management approaches.

7 Hours

UNIT - 2
PLANNING: Nature, importance and purpose of planning process – objectives - Types of plans (Meaning only) - Decision making – importance of planning – steps in planning, Planning premises – Hierarchy of plans.

6 Hours

UNIT - 3
ORGANIZING AND STAFFING: Nature and purpose of organization, principles of Organizations – Types of organisation - Departmentation – Committees Centralization vs. Decentralisation of authority and responsibility, span of Control, MBO, and MBE(Meaning only) Nature and importance of Staffing – process of selection and recruitment (in brief).

6 Hours

UNIT - 4
DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles and motivation theories, communication – Meaning and importance – Coordination, meaning and importance and Techniques of Co – ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief)

7 Hours

PART - B

ENTREPRENEURSHIP

UNIT - 5
ENTREPRENEUR: Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur – an emerging Class. Concept of Entrepreneurship – Evolution of

Entrepreneurship, development of Entrepreneurship steps in entrepreneurial process, Role of entrepreneurs in Economic Development: Entrepreneurship in India; Entrepreneurship – is Barriers.

6 Hours

UNIT - 6
SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives: Scope; role of SSI in Economic Development. Advantages of SSI. Steps to start in SSI – Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans. Impact of Liberalization, Privatisation, Globalization on S.S.I., Effect of WTO/GATT Supporting Agencies of Government for S.S.I., Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only)

7 Hours

UNIT - 7
INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC.

6 Hours

UNIT - 8
PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities:
Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study

7 Hours

TEXT BOOKS:
1. **Principles of Management** – P.C. Tripathi, P.N. Reddy; Tata McGraw Hill, 2nd Edition.
2. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai–Himalaya Publishing House
3. **Entrepreneurship Development** – Small Business Enterprises – Poornima M Charantimath – Pearson Education –2006, 2nd Edition.
4. **Management and Entrepreneurship** – N.V.R. Naidu & T. Kirshna Rao, I.K. International, New Delhi – 2008.

REFERENCE BOOKS:
1. **Management Fundamentals - Concepts, Application, Skill Development** – 1st Edition , Robert Lusier – Thomson ,
2. **Entrepreneurship Development** – S S Khanka – S Chand & Co.
3. **Management – Stephen Robbins** – Pearson Education / PHI -17th Edition, 2003.

CONTROL ENGINEERING

Subject Code	:	**06IP52**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION& MATHEMATICAL MODEL: Concept of automatic controls, open and closed loop systems, concepts of feedback, requirement of an ideal control system. Mechanical system (both translation and rotational), Electrical system, D. C. Motors, Hydraulic systems (liquid level and fluid power systems), Thermal systems, Hydraulic servomotor

8 Hours

UNIT - 2
SYSTEM RESPONSE: First order subjected to step and ramp input, second order system response to step input, concepts of time constant and its importance in speed of response. Mathematical concept of stability-Routh Hurwitz Criterion

6 Hours

UNIT - 3
BLOCK DIAGRAMS & SIGNAL FLOW GRAPHS: Transfer functions definition, block representation of system elements, reduction of block diagrams, Multiple input/ outputs of block diagrams, Signal flow graphs, Basic properties and gain formula to block. Mason gain formula

6 Hours

UNIT - 4
CONTROL ACTION: Types of controllers – Proportional, integral, Proportional Integral, Proportional Integral Differential controllers (Basic concepts only)

6 Hours

PART - B

UNIT - 5
FREQUENCY RESPONSE: Polar and rectangular plots for the frequency response, system analysis using Nyquist diagrams. Relative stability concepts, gain margin and phase margin.

6 Hours

UNIT - 6
LOGARITHMIC PLOTS: Bode attenuation diagrams, stability analysis using Bode diagrams, simplified Bode diagrams.

6 Hours

UNIT - 7
ROOT LOCUS PLOTS: Definition of root loci, Rules for rapid plotting, constructing of root loci, Stability analysis.

6 Hours

UNIT - 8
INTRODUCTION TO STATE VARIABLE CHARACTERISTICS OF LINEAR SYSTEMS: Introduction to the state concepts, state equation of linear continuous data system. Matrix representation of state equations.

8 Hours

TEXT BOOKS:
1. **Modern Control engineering –** K Ogatta, Prentice Hall (India) Pearson Education 2003.
2. **Automatic Control Systems** – Francis. H Raven 5th edition. McGrawHill   1995.

REFERENCE BOOKS:
1. **Feedback Control Systems** – Schaum's series. 2001
2. **Control Systems -** I J Nagarath & M Gopal, New age International Publishers. 2002
3. **Control Systems** - M Gopal, Tata McGraw Hill, New Delhi, 2nd Edition,   2002.
4. **Control Systems Engineering-** S N Sivanandom, Vikas publishing House, New Delhi, 2001.
5. **Modern Control Systems** - Rihard C Dorf and Robert. H. Bishop Addison – Wesley, 8th Edition, 1998.
6. **Automatic Control Systems** - B.C Kuo.- Prentice Hall (India), 1995.
7. **System Dynamics & Control** -Eronini umez – Eronini Thomson Learning 2002.
8. **'Analysis of Linear Control systems-** by Narasimham R L - I K International Publishing house Pvt. Ltd.

THEORY OF METAL CUTTING

Subject Code	: **06IP53**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1

MECHANICS OF METAL CUTTING: Mechanism of chip formation, Orthogonal & Oblique cutting, Determination of shear plane angle, forces on the chips, forces in orthogonal cutting, merchant circle diagram and analysis, co-efficient of friction, power & energy relationship, velocity relationship, shear-strain, factors affecting forces and power, types of chips, built-up edge, problems.

8 Hours

UNIT - 2

MEASUREMENT OF CUTTING FORCES: Reasons for measuring cutting forces, Classification of cutting force dynamometers – mechanical, hydraulic, pneumatic, optical, inductance, piezoelectric, and strain gage type dynamometers, Dynamometers for lathe, drilling, and milling, Calibration of dynamometers.

7 Hours

UNIT - 3

TOOLS WEAR, TOOL LIFE: Mechanisms of tool wear, Sudden, gradual wear, crater wear, flank wear, tool failure criteria, tool life equations, effect of process parameters on tool life, tool life tests – conventional & accelerated, tool wear measurement, machinability index

6 Hours

UNIT - 4

GEOMETRY OF CUTTING TOOLS: Single point and multi point cutting tools, tools in hand nomenclature, tool point reference systems, tool angle specifications – ISO and ASA systems, conversion from one system to another. Recommended tool angles, Effect of cutting parameters on tool geometry.

6 Hours

PART - B

UNIT- 5

TOOL MATERIALS AND THEIR PROPERTIES: Characteristics of tools materials, types of tool materials – carbon tool steels, high speed steels, cast alloys, cemented carbides, ceramics, diamonds, sialon, CBN, UCON,

recommended cutting speeds for the above tools, tool & die steels – air, water, oil hardening of tools and their applications.

7 Hours

UNIT - 6

THERMAL ASPECTS IN METAL CUTTING: Heat sources in metal cutting, temperature in chip formation, temperature distribution, experimental determination of tool temperatures.

6 Hours

UNIT - 7

CUTTING FLUIDS: Basic actions of cutting fluids, properties of cutting fluids, selection of cutting fluids, application of cutting fluids, filtration of fluids, recommended cutting fluids.

6 Hours

UNIT - 8

ECONOMICS OF MACHINING: Introduction, elements of total production cost, optimum cutting speed and tool life for minimum cost, optimum cutting speed and tool life for maximum production, problems.

6 Hours

TEXT BOOKS:
1. **Fundamentals of metal cutting and machine tools**- B.L.Juneja and G.S.Sekhon. Willy Eastern Limited – 1987.
2. **Metal Principles**-1st Edition, M.C.ShawOxford and I.B.H.,
3. **Principles of metal cutting**- Sen & Bhattacharya New central book Agency – 1969.
4. **Metal Cutting and Tool design**- Dr. B.J.Ranganath   Vikas Publishing house - 1993

REFERENCE BOOKS:
1. **Metal Cutting theory**- Black P.H, MC Hraw Hill – 1996.
2. **Metal cutting theory and cutting tool design** - Arshinov and Atekseev Mir Publishers – 1976.
3. **Fundamentals of Machining and Machine Tools** - R.K.Singal - I K International Publishing house Pvt. Ltd – 2008.
4. **Thermal Metal cutting** - B.J. Ranganath - I K International Publishing house Pvt. Ltd – 2008.

WORK STUDY AND ERGONOMICS

Subject Code	:	**06IP54**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRODUCTIVITY: Definition of productivity, individual enterprises, task of management Productivity of materials, land, building, machine and power. Measurement of productivity, factors affecting the productivity, productivity improvement programmes, wages and incentives (simple numerical problems)

7 Hours

UNIT - 2
WORK STUDY: Definition, objective and scope of work study. Human factor in work study. Work study and management, work study and supervision, work study and worker

6 Hours

UNIT - 3
INTODUCTION TO METHOD STUDY: Definition, objective and scope of method study, activity recording and exam aids. Charts to record moments in shop operation – process charts, flow process charts, travel chart and multiple activity charts.(With simple problems)

7 Hours

UNIT - 4
MICRO AND MEMO MOTION STUDY: Charts to record moment at work place – principles of motion economy, classification of moments two handed process chart, SIMO chart, and micro motion study. Development,definition and installation of the improved method, brief concept about synthetic motion studies.

6 Hours

PART - B

UNIT - 5
INTRODUCTION TO WORK MEASUREMENT: Definition, objective and benefit of work measurement. Work measurement techniques. Work sampling: need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.

6 Hours

UNIT - 6

TIME STUDY: Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors of affecting rate of working, allowances and standard time determination. Predetermined motion time study – Method time measurement (MTM)

7 Hours

UNIT - 7

ERGONOMICS: Introduction, areas of study under ergonomics, system approach to ergonomics model, man-machine system. Components of man-machine system and their functions – work capabilities of industrial worker, study of development of stress in human body and their consequences. computer based ergonomics

6 Hours

UNIT - 8

DESIGN OF MAN-MACHINE SYSTEM: Fatigue in industrial workers. Quantitative qualitative representation and alphanumeric displays. Controls and their design criteria, control types, relation between controls and displays, layouts of panels and machines. Design of work places, influence of climate on human efficiency. Influence of noise, vibration and light.

7 Hours

TEXT BOOKS:
1. **Introduction to work study-** ILO, III Revised Edition, 1981.
2. **Motion and Time study-** Ralph M Barnes, John Wiley, 8th Edition, 1985.
3. **Engineered work Measurement**- Wledon, ELBS , 1991.
4. **Motion and Time study-** Marvin E. Mundel, PHI, 1st edition

REFERENCE BOOKS:
1. **Human Factors in Engineering Design**-6th Edition, M S Sanders and E J McCormic, Mc Graw Hill.
2. **Work Study and Ergonomics**– S Dalela and Sourabh, Chand Publishers, 3rd edition.
3. **Industrial Engineering Hand book–** Maynard.

Subject Code	:	**06IP/IM55**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Role of computers in design and manufacturing. Influence of computers in manufacturing environment. Product cycle in conventional & computerized manufacturing environment. Introduction to CAD, Introduction to CAM. Advantages and disadvantages of CAD and CAM.

3 Hours

HARDWARE IN CAD

Basic Hardware structure, working principles, usage and types of hardware for CAD - input and output Devices, memory, CPU, hardcopy and Storage devices.

4 Hours

UNIT - 2

COMPUTER GRAPHICS: Software configuration of a graphic system, function of a Graphics package, construction of geometry, wire frame and solid modelling, . Geometric 2 D and 3 D homogeneous transformations with simple problems. Introduction to exchange of modelling data – Basic features of IGES, STEP, DXF, DMIS.

6 Hours

UNIT - 3

FINITE ELEMENT ANALYSIS: Introduction, basic concepts, discretization, element types, nodes and degrees of freedom, mesh generation, constraints, loads, pre-processing, Application to Static analysis.

6 Hours

UNIT - 4

NC, CNC, DNC TECHNOLOGY: NC, CNC, DNC modes, NC elements, advantages and limitations of NC, CNC. Functions of computer in DNC.

6 Hours

PART - B

UNIT - 5

CNC MACHINE TOOLS: Turning tools geometry, milling tooling systems, tool presetting, ATC work holding. CNC machine tools, Overview of different CNC machining centres, CNC turning centres, high speed machine tools.

7 Hours

UNIT - 6
CNC PROGRAMMING: Part program fundamentals – steps involved in development of a part program. Manual part programming-milling & turning
                                                                    8 Hours

UNIT - 7
APT PROGRAMMING: APT Programming in drilling, milling and turning with problems
                                                                    6 Hours

UNIT - 8
INTRODUCTION TO ROBOTICS: Introduction, Robot Configuration, Robot Motions, Programming the Robots, Robot- Programming Languages, End effectors, Work Cell, Control and Interlock, Robot Sensor, Robot Applications.
                                                                    6 Hours

TEXT BOOKS:
1. **CAD / CAM Principles and Applications** - P.N. Rao, TMH, New Delhi, 2002.
2. **CAD/CAM-** Mikell P-groover, Emory W. Zimrners Jr Pearson Education inc, 2003.

REFERENCE BOOKS:
1. **Principles of Interactive Computer Graphics** - Newman and Sproull, Tata McGraw Hill, 1995.
2. **NC Machine programming & software Design** -Chno-Hwachang, Michel.A. Melkanoff, Prentice Hall, 1989.
3. **Computer Graphics** by Steven Harrington, McGraw Hill Book Co.
4. **CAD/CAM** -Ibrahim Zeid, Tat McGraw Hill, 1999.
5. **Computer Aided Manufacturing** - P.N. Rao, N.K. Tewari and T.K. Kundra Tata McGraw Hill 1999.
6. **Introduction to FEM**, T Chandra Patta Ashok D Bebgundu, 2002
7. **Basic of Computer Aided Gemetric Design** - M Ganesh - I K International Publishing house Pvt. Ltd.
8. **Basic Computer Aided Geometric Design** - Ganesh. M – I. K. International, New Delhi - 2008.

DESIGN OF MACHINE ELEMENTS

Subject Code	:	**06IP/ME56**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

DESIGN FOR STATIC STRENGTH: Design considerations: Codes and Standards, Static strength; Static loads and factor of safety; Theories of failure -Maximum normal stress theory, maximum shear stress theory, Distortion energy theory; Failure of brittle materials, Failure of ductile materials. Stress concentration, Determination of Stress concentration factor. Combined Stress concentration factor.

7 Hours

UNIT - 2

DESIGN FOR FATIGUE STRENGTH: Introduction, S -N diagram, Low cycle fatigue, High cycle fatigue, Endurance limit. Modifying factors -size effect, surface effect, Stress concentration effects; Fluctuating stresses, Fatigue strength under fluctuating stresses, Goodman and Soderberg relationship; Stresses due to combined loading, cumulative fatigue damage.

6 Hours

UNIT - 3

JOINTS AND COUPLING: Design of rigid flange coupling, Bush & pin type flexible coupling. Cotter and Knuckle joints.

6 Hours

UNIT - 4

DESIGN OF SHAFTS:

Torsion of shafts, design for strength & rigidity, with steady loading, ASME & BIS codes for design of transmission shafting, shafts under fluctuating loads and combined loads

7 Hours

PART - B

UNIT - 5

DESIGN OF GEARS: Introduction to Spur, Helical & Bevel gears. Design of spur gear, stresses in gear tooth, Lewis equation, form factor- dynamic and wear load.

6 Hours

UNIT - 6

MECHANICAL JOINTS: Riveted Joints -Types, rivet materials, Failures of Riveted joints, Efficiency, Welded Joints -Types, Strength of butt and fillet welds.

7 Hours

UNIT - 7
DESIGN OF SPRINGS: Types of springs -stresses in Coil springs of circular and non circular cross sections. Tension and compression springs. Stress in Leaf springs (Simple problems).

6 Hours

UNIT - 8
LUBRICATION AND BEARINGS: Mechanisms of Lubrication - Viscosity, bearing modulus, coefficient of friction, minimum oil film thickness-Heat Generated, Heat dissipated, bearing materials, lubricants and properties. Examples of journal bearing and thrust bearing design, Ball and Roller Bearings: Bearing life, equivalent bearing load, selection of bearings of different types.

7 Hours

TEXT BOOKS:
1. **Mechanical Engineering Design** -Joseph Edward Shigley, Tata McGraw Hill, New Delhi 1986.
2. **Machine Design** -.VL. Maleev and Hartman, CBS Publishers & Distribution, Delhi, 1983. .

DESIGN DATA HAND BOOKS:
1. **Design Data Hand Book-**K. Mahadevan and Balaveera Reddy, CBS Publication.
2. **Design Data Hand Book**- Vol.l & Vol.2 -Dr. K. Lingaiah, Suma Publications, Bangalore
3. **Design Data Hand Book** -Prof. H. a. Patil, Shri Shastri Prakashan, and Belgaum.

REFERENCE BOOKS:
1. **Machine Design** -Robert .L, Norton -Pearson Education Asia, New Delhi, 2001.
2. **Theory and Problems of Machine Design** -Hall, Holowinko, Laughlin, -Schaums Outline Series, 2002
3. **Elements of Machine Design** -N. C. Pandey and C. S. Shah, 2002 - Chorotar Publishing House
4. **Design of Machine Elements** -V. B. Bahandri, -Tata McGraw Hill Publishing Co. Ltd., New –Delhi, 2000.
5. **Machine Component & Design** -William Orthwan, Jaico Publishing Co.
6. **Fundamentals of Design** -Benerad J Hamrock, Bo -Jacobson & Steven R. Schmid.
7. **Fundamentals of Machine Design Component -**Robert C. Juvinall and Kurt M. Marshek -John & sons, 3rd edition, 2002.
8. **Machine Design** -R. K. Jain, Khanna Publications, New Delhi.

MECHANICAL LAB

Subject Code	:	**06IPL57**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky Martins Apparatus
2. Determination of Calorific value of solid and gaseous fuels.
3. Determination of Viscosity of a lubricating oil using Redwoods and Saybolts – Viscometers.

PART - B

1. Performance Tests on Four stroke Petrol & Diesel Engines, Calculations of IP, BP, Thermal efficiencies, SFC, FP and heat balance sheet
2. Multi cylinder petrol / diesel engine (Morse Test)
3. Calibration of Venturimeter
4. Flow through pipes
5. Performance test on centrifugal and reciprocating pumps

INDUSTRIAL ENGINEERING LAB

Subject Code	:	**06IPL58**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Recording Techniques : preparing the following charts and diagrams
   - Out line process chart
   - Flow process chart
   - Flow diagram
   - Multiple activity chart
   - String diagram, SIMO chart
   - Two handed process charts
2. Application of principle of motion economy
3. Measurement of effect of work on human body (Ergometer, Tread mill)
4. Rating exercises

PART - B

1. Determining the standard time for simple operation using stop watches and PMTS
2. Application of Acceptance Sampling Techniques (singe sampling plan & Plotting the O.C. Curve)
3. Experiments to generate data the results in normal distribution, and its interpretation.
4. Effect of Noise on human efficiency
5. Conceptual design of displays and controls.

THEORY OF METAL FORMING

Subject Code	:	**06IP61**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

ELEMENTS OF THE THEORY OF PLASTICITY: Flow curves, True stress and strain, yield criteria for ductile metals, Von Mise's criterion, Tresca criterion.

6 Hours

UNIT - 2

FUNDAMENTALS OF METAL WORKING: Classification of forming processes, Mechanics of Metal working – slab method, flow stress determination, temperature in Metal working, Hot working, Cold working, Warm working, strain - rate effects, metallurgical structure, friction and Lubrication.

8 Hours

UNIT - 3

FORGING PROCESS: Classification of forging operation, forging equipment, forging strain, open die forging – closed die forging, die forging load forging defects.

6 Hours

UNIT - 4

ROLLING OF METALS: Classification of rolling mills, hot and cold rolling forces and geometrical relationships in rolling, simplified analysis of rolling load, defects in rolled products, theories of cold and hot rolling, calculation torque and power required.

6 Hours

PART - B

UNIT - 5

EXTRUSION: Classification, equipments used, hot extrusion, deformation, lubrication and defects in extrusion, analysis of extrusion processes, hydrostatic extrusion, tube extrusion, production of seamless pipe and tubing.

6 Hours

UNIT - 6

DRAWING OF RODS, WIRES AND TUBES: Rod and wire drawing process, drawing dies, analysis of wire drawing, Tandem drawing process,

residual stress in rod, wire and tube drawing. Defects in drawing, tube drawing.

6 Hours

UNIT- 7
SHEET METAL FORMING PROCESS: Introduction, Forming methods, shearing, blanking, punching, bending, spring back, elimination of spring back, spinning, deep drawing stretch forming, redrawing, reverse drawing, defects in drawing, factors affecting drawability ration.

8 Hours

UNIT - 8
HIGH ENERGY RATE FORMING (HERF): Introduction to HERF, Process advantages, explosive forming electro discharge forming and electromagnetic forming, Rubber forming.

6 Hours

TEXT BOOKS:
1. **Mechanical Metallurgy** - Dieter. G. E - McGraw Hill, 2001
2. **Principle of Industrial metal working process**–Rowe Edward Arnold, London, CBS Publishers - 2002.

REFERENCE BOOK:
1. **ASM- Metals handbook,** Sach G. fundamentals of working of metals, Pergamon Press.

ENGINEERING ECONOMY

Subject Code	:	**06IP/IM62**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Engineering Decision- Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy.

6 Hours

UNIT - 2
INTEREST AND INTEREST FACTORS: Interest rate, simple interest Compound interest, Cash- flow diagrams, Exercises and Discussion.

7 Hours

UNIT - 3
PRESENT WORTH COMPARISON: Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence,

Net Present worth, Assets with unequal lives, infinite lives, Future worth comparison, Pay – back comparison, Exercises, Discussions and problems

7 Hours

UNIT - 4
EQUIVALENT ANNUAL WORTH COMPARISONS: Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison Consideration of asset life, Comparison of assets with equal and unequal lives, Use of sinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

7 Hours

PART - B

UNIT - 5
RATE OF RETURN CALCULATIONS: Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts, replacement models.

6 Hours

UNIT - 6
DEPRECIATION: Causes of Depreciation, Basic methods of computing depreciation charges

2 Hours

STRUCTURAL ANALYSIS OF ALTERNATIVES: Identifying and Defining alternatives, IRR analysis of mutually exclusive alternatives, Capital Budget view point, Ranking criteria.

5 Hours

UNIT - 7
REPLACEMENT ANALYSIS: Deterioration, obsolescence, inadequacy, Economic life for cycle replacements.

2 Hours

ESTIMATING & COSTING: Components of costs such as Direct Material Cost, Direct Labour Cost, Fixed, Over – Heads, Factory Costs, Administrative – Over Heads, First Cost, Marginal Cost, Selling price, Estimation for simple components.

4 Hours

UNIT - 8
EFFECTS OF INFLATION: Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/ Buy decisions

2 Hours

BREAK-EVEN ANALYSIS: Basic Concepts Linear & non-linear break even analysis.

4 Hours

TEXT BOOKS:
1. **Engineering economy**- RIGGS J.L**.,** McGraw Hill, 2002.
2. **Engineering economy**- PAUL DEGARMO, Macmillan Pub, Co. 2001.
3. Engineering –NVR. NAIDU, KM BABU and G. RAJENDRA Economy, New Age International Pvt. Ltd. - 2006

REFERENCE BOOKS:
1. **Industrial Engineering and Management** OP KHANNA, Dhanpat Rai & Sons 2000.
2. **Financial Management -**I M PANDAY, Vikas Publishing House 2002.
3. **Engineering economy** -THUESENH.G. PHI, 2002

TOOL ENGINEERING & DESIGN

Subject Code	: **06IP63**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
METAL CUTTING: Theory of Metal Cutting: Orthogonal and oblique cutting, Cutting action, Mechanism of chip formation, Types of Chips, Merchants Analysis.

8 Hours

UNIT - 2
TOOL MATERIALS: Requirements, Properties, Types of Materials like high carbon Steel, HSS, coated HSS, ceremics, carbides, coated carbides, CBN, Diamond Tools.

6 Hours

UNIT - 3
DESIGN OF METAL CUTTING TOOLS: Single point tool, Design consideration from strength, and Rigidity Consideration, chip Breakers Types, Form Tools.

8 Hours

UNIT - 4
DESIGN OF CUTTING TOOLS: Twist Drill, Milling Cutter, Problem pertaining to the above

6 Hours

PART - B

UNIT - 5
DESIGN OF MULTIPOINT CUTTING TOOL: Reamers, Broach, taps, Problem pertaining to the above.

6 Hours

UNIT - 6
JIGS & FIXTURES: Principles of Location, function of Jigs and fixtures, Types of Locators, Types of Clamps.

6 Hours

UNIT - 7
TYPES OF JIGS: Types of Jigs like plate, Drill Jig, Box Jig, Leaf Jig.

6 Hours

UNIT - 8
FIXTURE DESIGN: Turning Fixture, Milling fixture and planning fixtures.

6 Hours

TEXT BOOKS:
1. **Tools Design C Donaldson-** G.H. Le CAIN V.C Goold, TMH - 1976.
2. **Tooling data** -P. H. Joshi, Wheeler Publication – 2005.
3. **Metal Cutting and Tool design** - Dr. B.J. Ranganath, Vikas Publishing house - 1993,

REFERENCE BOOKS:
1. **Metal cutting theory and Tool Design**- Arshinav MIR Publications
2. **Jigs & Fixtures**- Grant – 1976.
3. **Introduction to Jigs & Fixtures**- Kempster. ELBS, Edn. 1974.
4. **Fundamentals of Tools Design**- ASTME – Prentice Hall India Publications – 1983.

NON-CONVENTIONAL MACHINING

Subject Code	:	**06IP/IM64**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: History, Classification, Comparison between conventional and non-conventional machining process selection.
MECHANICAL PROCESS: Ultrasonic machining (USM) : Introduction, Equipment, tool materials & tool Size, Abrasive slurry, Cutting tool system

design : Magnetostriction assembly, Tool cone (Concentrator), Exponential concentrator of circular cross section & rectangular cross section Hallow cylindrical concentrator. Mechanics of cutting : Theory of Miller & Shaw Effect of parameter : Effect of amplitude and frequency and vibration, Effect of grain diameter , Effect of applied static load, Effect of slurry, Tool and work material, USM process Characteristics ; Material removal rate, tool wears, Accuracy, surface finish., Applications, Advantages & Disadvantages of USM.

8 Hours

UNIT - 2
ABRASIVE JET MACHINING (AJM): Introduction, Equipment, Variables in AJM: carrier Gas Type of abrasive, Size of abrasive grain, velocity of the abrasive jet, Mean No. abrasive particles per unit volume of the carrier gas, Work material, stand off distance (SOD) nozzle design shape of cut. Process characteristics – Material removal rate, Nozzle wear, Accuracy & surface finish. Applications, Advantages & Disadvantages of AJM.

6 Hours

UNIT - 3
ELECTROCHEMICAL AND CHEMICAL METAL REMOVAL PROCESS:
Electrochemical machining (ECM): Introduction, Study of ECM machine, Elements of ECM process : Cathode tool, Anode work piece, source of DC power, Electrolyte, Chemistry of the process ECM process characteristics – Material removal rate, Accuracy, Surface finish.

6 Hours

UNIT - 4
ECM TOOLING: ECM tooling technique 7 example, Tool &insulation materials, Tool size Electrolyte flow arrangement, Handling of slug., Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Horning, deburing, Advantages, Limitations.

6 Hours

PART - B
UNIT - 5
CHEMICAL MACHINING (CHM): Introduction, Elements of process Chemical blanking process :-Preparation of workpiece. Preparation of masters, masking with photo resists, etching for blanking, applications of chemical blanking, chemical milling (Contour machining) :-Process steps – masking, Etching, process characteristics of CHM :-material removal rate accuracy, surface finish, Hydrogen embrittlement, Advantages & application of CHM.

8 Hours

UNIT - 6
EDM PROCESS: Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear, EDM tool design : Choice of matching operation, electrode materiel selection, under sizing and length of electrode Machining time.

6 Hours

UNIT - 7
EDM PROCESS CHARACTERISTICS: Flushing – Pressure flushing synchronized with electrode movement, EDM process characteristic: Metal removal rate, Accuracy surface finish, Heat affected Zone. Machine tool selection, Application: EDM accessories / applications, electrical discharge grinding, Travelling wire EDM.

6 Hours

UNIT - 8
PLASMA ARC MACHINING (PAM):
Introduction, equipment non-thermal generation of plasma, selection of gas, Mechanism of Metal removal, PAM parameters, Process characteristics. Safety precautions, Applications, Advantages and limitations.

6 Hours

TEXT BOOKS:
1. **Modern machining process** - PANDEY AND SHAH, TATA Mc Graw Hill 2000.
2. **New Technology-** BHATTACHARAYA 2000.

REFERENCE BOOKS:
1. **Production Technology**, - HMT TATA McGraw Hill 2001.
2. **Modern Machining Process** - ADITYAN, 2002.
3. Fundamentals of Machining and Machine **Tools** by R.K.Singal - I K International Publishing house Pvt. Ltd,
4. **"Thermal Metal Cutting Process -**Dr. B.J. Ranganath, I.K. International, New Delhi. – 2008.

QUALITY ASSURANCE AND RELIABILITY

Subject Code	:	**06IP/IM65**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Definition of Quality, Quality function, Dimensions of Quality, Quality Engineering terminology, Brief history of quality methodology, Statistical methods for quality improvement, Quality costs – four categories costs and hidden costs. Brief discussion on sporadic and chronic quality problems. Introduction to Quality function deployment.

6 Hours

UNIT - 2
QUALITY ASSURANCE: Definition and concept of quality assurance, departmental assurance activities. Quality audit concept, audit approach etc. structuring the audit program, planning and performing audit activities, audit reporting, ingredients of a quality program.

6 Hours

UNIT - 3
STATISTICAL PROCESS CONTROL: Introduction to statistical process control – chance and assignable causes variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational subgroups. Analysis of patterns of control charts. Case Studies on application of SPC. Process capability – Basic definition, standardized formula, relation to product tolerance and six sigma concept of process capability, Seven QC tools.

6 Hours

UNIT - 4
CONTROL CHARTS FOR VARIABLES: Controls charts for X bar and Range ®, statistical basis of the charts, development and use of X bat and R charts, interpretation of charts. Control charts for X bar and standard deviation (S), development and use of X bat and S chart. Brief discussion on – Pre control X bar and S control charts with variable sample size, control charts for individual measurements, cusum chart, moving-range charts.

8 Hours

PART - B

UNIT - 5
CONTROL CHARTS FOR ATTRIBUTES: Controls chart for fraction non- conforming (defectives) development and operation of control chart,

brief discussion on variable sample size. Control chart for non-conformities (defects) – development and operation of control chart for constant sample size and variable sample size. Choice between variables and attributes control charts. Guidelines for implementing control charts.

8 Hours

UNIT - 6
SAMPLING INSPECTION: Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Determinations of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk, published sampling plans, Gauge R and R and MSA.

6 Hours

UNIT - 7
STATISTICAL THEORY OF TOLERANCES: Application of statistical theory of tolerances to design of tolerances in random assemblies and application in other areas.

6 Hours

UNIT - 8
RELIABILITY AND LIFE TESTING: Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations, Redundancy and improvement factors evaluations.

6 Hours

TEXT BOOKS:
1. **Introduction to statistical Quality Control**- D C Montgomery 3rd Edition, John Wiley and Sons.
2. **Quality Planning & Analysis-** J M Juran, Frank M Gryna; 3rd edition, Tata McGraw Hill.
3. **Total Quality Management** – NVR Naidu, KM Babu and G. Rajendra – New Age International Pvt. Ltd – 2006.

REFERENCE BOOKS:
1. Statistical Quality Control- Grant and Leavenworth, 6th Edition McGraw Hill,
2. **The QS9000 Documentation Toolkit-** Janet L Novak and Kathleen C Bosheers, 2nd Edition, Prenctice Hall PTR.
3. I**SO 9000 a Manual for Total QualityManagement**-, Suresh Dalela and Saurabh, 1st Edition, S Chand and Co.
4. **Total Quality Management-**I Kesavan R.K. International, New Delhi – 2007.

23

CAD/CAM LAB

Subject Code	:	**06IPL67**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

Modelling and simulation of Machining process of simple machine parts using CAM packages – minimum six models.

PART - B

1. Study of Finite element analysis package
2. 1d, 2d, structural problems
3. Evaluation of displacement – stress and strain,
4. Problem involving beams and trusses.

SUGGESTED PACKAGES
Solid edge, Solid works, UNI Graphics, ANSYS, NISA, NASTRAN

MACHINE TOOLS LAB

Subject Code	:	**06IPL68**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Acceptance tests on a lathe
2. Acceptance tests on a drilling machine
3. Acceptance tests on a milling machine
4. Determination of cutting forces during milling using Milling tool dynamometer
5. Measurement of cutting tool temperature using thermo-couples
6. Determination of chip-reduction co-efficient during metal cutting on a lathe.

PART - B

7. Disassembly and Assembly of the following machine parts:

   i)   Lathe tail stock
   ii) Swivel vice
   iii) Screw jack
   iv) Tool head of shaper
   v)   Indexing head

VALUE ENGINEERING AND INDUSTRIAL BEST PRACTICE

Subject Code	: **06IP/IM661**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO VALUE ANALYSIS: Definition of Value, Value Analysis, Value Engineering, Value Management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, Applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept.

6 Hours

UNIT - 2
TYPE OF VALUES: Reasons for unnecessary cost of product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis. Meaning of Value, types of value & their effect in cost reduction. Value analysis procedure by simulation. Detailed case studies of simple products.

7 Hours

UNIT - 3
FUNCTIONAL COST AND ITS EVALUATION: Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and Noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional relationships and case studies.

7 Hours

UNIT - 4
PROBLEM SETTING & SOLVING SYSTEM: A problem solvably stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

PROBLEM SETTING & SOLVING SYSTEM: Goods system contains everything the task requires. Various steps in problem solving, case studies.

6 Hours

25

PART - B

UNIT - 5
VALUE ENGINEERING JOB PLAN: Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts,. Information phase, Analysis phase, Creative phase, Judgement phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal.

6 Hours

UNIT - 6
VALUE ENGINEERING TECHNIQUES: Result Accelerators or New Value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques.

6 Hours

UNIT - 7
ADVANCED VALUE ANALYSIS TECHNIQUES: Functional analysis system technique and case studies, Value analysis of Management practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College, Hospitals, School Problems etc., (service type problems).

8 Hours

UNIT - 8
APPLICATION OF VALUE ANALYSIS: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques.

6 Hours

TEXT BOOKS:
1. **Techniques of Value Engineering and Analysis** - Lawrence D Miles McGraw Hill Book Co.
2. **Value engineering for COST REDUCTION and PRODUCT IMPROVEMENT** – M.S. Vittal, Systems Consultancy Services Edn 1993.

REFERENCE BOOKS:
1. **Value Analysis** – W.L. Gage, McGraw Hill Book Company.
2. **Value Management, Value Engineering and Cost Reduction** – Edward D Heller Addison   Wesley Publishing Company 1971.
3. **Value Analysis for Better Management** – Warren J Ridge American   Management   Association Edn 1969.

4. **Elements of Production Planning and Control** – Samuel Eilon, Universal Book Corporation. Edn 1981.
5. **Getting More at Less Cost (The Value Engineering Way)** – G.Jagannathan Tata Mcgraw Hill Pub. Comp. Edn 1995.
6. **Value Engineering** – Arther E Mudge McGraw Hill Book Comp. Edn 1981.
7. **An Introduction to Operational Research** – C R Kothari Vikas Pub. House Ovt. Ltd., Edn. 1982.

MECHANICAL VIBRATIONS

Subject Code	:	**06IP/IM662**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Types of vibrations, S.H.M, principle of super position applied to Simple Harmonic Motions, Beats. Fourier theorem and simple problems. Single degree of freedom systems and Simple problems.

6 Hours

UNIT - 2
UNDAMPED FREE VIBRATIONS: Introduction, undamped free vibration – natural frequency of free vibration, stiffness of spring elements, effect of mass of spring.

6 Hours

UNIT - 3
DAMPED FREE VIBRATIONS: Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement.

7 Hours

UNIT - 4
FORCED VIBRATION: Single degree freedom systems, steady state solution with viscous damping due to harmonic force, solution by complex algebra. Concept of response, Reciprocating and rotating unbalance, vibration isolation – transmissibility ratio. Energy dissipated by damping, sharpness of resonance, base excitation.

7 Hours

PART - B

UNIT - 5
VIBRATION MEASURING INSTRUMENTS: Accelerometer and vibrometers. Whirling of shafts with and without air damping. Discussion of speeds above and below critical speeds.

6 Hours

UNIT - 6
SYSTEMS WITH TWO DEGREES OF FREEDOM:
Introduction, principal modes and normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, free vibration in terms of initial conditions. Geared systems. Forced Oscillations – Harmonic excitation. Applications: (a) Vehicle suspension (b) Dynamic vibration absorber (c) Dynamics of Reciprocating Engines.

7 Hours

UNIT - 7
CONTINUOUS SYSTEMS: Introduction, vibration of string, longitudinal vibration of rods, torsional vibration of rods, Euler's equation for beams, simple problems, M D OF systems. Introduction, Influence co-efficient, Maxwell reciprocal theorem.

7Hours

UNIT - 8
NUMERICAL METHODS FOR MULTI DEGREE FREEDOM SYSTEMS:
Dunkerley's equation. Orthogonality of principal modes,. Holzer's method, Geared and branched systems, Rayleigh's method, , Stodola method.

6 Hours

TEXT BOOKS:
1. **Fundamental of Mechanical Vibration** - S. Graham Kelly, Tata McGrawHill, 2000.
2. **Mechanical Vibrations** - Singireru. S. Rao, Pearson Education Inc., 4th Edition, 2003.

REFERENCE BOOKS:
1. **Mechanical Vibrations** – Kelly, Schaum's Outline Series, 1996, McGraw Hill.
2. **Vibrations**- Tse, Morse & Hincle, Prentice Hall India, 1990.
3. **Mechanical Vibrations** - Austin. H. Church, John Wiley and Sons, 1963.
4. **Theory & Practice of Mechanical Vibrations**- J.S. Rao & K. Gupta, New Age Intl., Publication 2001.

5. **Theory of Vibration with applications** - William T. Thomson and Maric Dillon Dahleh, Pearson Education Inc., 5th Edition, 2003.
6. **Vibrations** - Balakumar Balachandran and Edward B. Magrab, Thomson Asia, 2003.
7. **Fundamentals of Vibrations** - Leonard Mcirovitch, McGraw Hill, 2001.
8. **Fundamentals of Mechanical Vibrations** - S. Graham Kelly, Mc Graw Hill International Edition 2000.
9. **Engineering Vibrations** - William J Bottega - I K International Publishing house Pvt. Ltd. 2nd Edition.

FINITE ELEMENT METHOD

Subject Code	:	**06IP/IM663**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO FEM:
Need for sue of FEM – Advantages and Disadvantages of FEM Matrix algebra – Terminologies relating ot matrices, methods of solution of linear algebraic equations. Eigen values and Eigen vectors, Simple numeric Gaussian Quadrature – 1 pt. 2pt and 3pt formula.

7 Hours

UNIT - 2
BASIC OF THEORY OF ELASTICITY:
Definition of stress and strain, stress-strain relations; strain-displacement Relations in 2D and 3D Cartesian and polar coordinates.

6 Hours

UNIT - 3
CONTINUUM METHODS:
Variational methods Rayleigh-Ritz methods applied to simple problems on axially loaded members cantilever. Simply supported and fixed beam with point loads and UDL Galerkin method as applied to simple elasticity problem.

7Hours

UNIT - 4
FEM-BASIC DEFINITIONS:
displacement method Nodal degrees of freedom different coordinate systems

shape functions. Lagrangian polynomial; complete Formulation of bar-truss-beam-triangular-quadrilateral Tetrahedral hexahedral elements.

6 Hours

PART - B

UNIT - 5
BOUNDARY CONDITIONS:
SPC and MPC. Methods of handling boundary conditions eliminating method-penalty method. Simple numericals, ISO parametric sub parametric super parametric elements Convergence criteria – requirements of convergence of a displacement model.

7 Hours

UNIT - 6
HIGHER ORDER ELEMENTS:
bar – triangular-quadrilateral elements. Tetrahedral and hexahedral elements (non-Formulation) – Pascal triangle – Pascal pyramid. Introduction to axis symmetric problems-formulation of axis symmetric triangular element.

7 Hours

UNIT - 7
DYNAMIC ANALYSIS:
Formulating-element mass matrics for 1D and 2D element, computation of Eigen value and vector for simple one Dimensional analysis.

6 Hours

One dimensional steady state heat conduction Formulation of 1D element simple numerical using 1D element. Structure of a commercial FE package. Pre-processor. Solver post processor.

6 Hours

TEXT BOOKS:
1. **Finite Element Method** – J.N.Reddy, Tat McGraw Hill edition 2002.
2. **Introduction to Finite elements in engineering** - Chandraupatla and Belegundu – Pearson edn, 2002.

REFERENCE BOOKS:
1. **A First course in Finite Element methods** - Daryl.L.Logon, Thomson Learning 3rd edi. 2001.
2. **Fundamentals of Finite Element method** - Hutton – Mc Graw Hill, 2004.
3. **Concepts & applications of FEA** - Robert Cook etal – Jonh willey & sons 2002.
4. **Finite element analysis** - Chandrupatla, University press, 2002.
5. **Theory and Practice of Finite elements** - Alexandre ERN - I K International Publishing house Pvt. Ltd – 2004.

HUMAN RESOURCE MANAGEMENT

Subject Code	:	**06IP/IM664**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Evolution of HRM, Objectives, Functions and Policies.
6 Hours

UNIT - 2
HUMAN RESOURCE PLANNING: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting, job Description, Job Specification
7 Hours

UNIT - 3
RECRUITMENT: Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.
6 Hours

UNIT - 4
SELECTION: Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews)
7 Hours

PART - B

UNIT - 5
TRAINING AND DEVELOPMENT: Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.
7 Hours

UNIT - 6
PERFORMANCE APPRAISAL: Components (all round performance appraisal), Methods. Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.
7 Hours

UNIT - 7
COUNSELLING AND HUMAN RESOURCE ACCOUNTING: Characteristics, Need, Function, Types, Suggestions for personnel development, communication function, communication process, effective communication. Human resource records, Advantages of HR accounting, Various methods of accounting

6 Hours

UNIT - 8
INDUSTRIAL RELATIONS: Indian trade union act, standing orders act, Indian factories act, ESI act.
INDUSTRIAL DISPUTES AND SETTLEMENT: Indian Industrial Disputes act, Industrial disputes settlement machinery. Works committee, Board of Conciliation, Voluntary Arbitration, Compulsory arbitration, Court of inquiry, Industrial tribunal, Adjudication.

6 Hours

TEXT BOOKS:
1. **Human Resources Management** – Dr. K Ashwathappa, Tata McGraw Hill, Edition 1999
2. **Management of Organisations Behaviour** – Hersey and Blanchard – Prentice Hall of India Edn – 1998
3. **Industrial Relations** – Arun Monappa – TMH, ISBN – 0-07-451710-8

REFERENCES BOOKS:
1. **Personnel / Human resource Management** – Decenoz and robbins – PHI, 2002.
2. **Management of Human Resources** – CB Mamoria – Himalaya Publication House, 2003
3. **Industrial Acts** - Jain, 2004

SOFTWARE ENGINEERING AND MANAGEMENT

Subject Code	:	**06IP/IM665**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
THE PRODUCT AND THE PROCESS: The product - Evolving role of Software, Characteristics, Components, and Applications. The Process - Software process, Models - Linear, sequential, Prototype, RAD, Process Technology, Software Development Life cycle.

6 Hours

UNIT - 2
SOFTWARE PROJECT MANAGEMENT CONCEPTS: The Management Specification, People, Problem, Process

6 Hours

UNIT - 3
SOFTWARE PROJECT PLANNING: Objectives, Scope, Resource, Project estimation, Decomposition Techniques, Empirical Estimation Models. Make-buy decision, Automated estimation tools.

7 Hours

UNIT - 4
RISK MANAGEMENT: Reactive v/s Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Monitoring.

6 Hours

PART - B

UNIT - 5
SOFTWARE PROJECT SCHEDULING AND TRACKING: Basic concepts, defining a task set selection, Defining Scheduling, Project Plan

SOFTWARE QUALITY ASSURANCE: Quality assurance concept, Cost impact of software defects, Technical review, statistical Quality assurance, software reliability, ISO 9000 Quality standards.

6 Hours

UNIT - 6
SYSTEM ANALYSIS CONCEPT AND PRINCIPLES: Requirement analysis, Principles, software prototyping, specifications, Data Modelling, Functional Modelling and Information Flow, Structured Analysis, Data Dictionary.

7 Hours

UNIT - 7
SYSTEM DESIGN CONCEPTS AND PRINCIPLES: Design Process Concept, Modular design, Documentation Design Methods, Data Design, Interface Design, Procedural Design, Design for Real Time Systems, System, Considerations in Real Time systems, Analysis and Simulation of Real Time Systems.

6 Hours

UNIT - 8
SOFTWARE TESTING: Objectives, Principles, Testability

SOFTWARE QUALITY AND RELIABILITY: Introduction, Software failure modes, software structure and modularity, language, Data reliability, Fault tolerance, software checking and software testing.

OBJECT ORIENTED CONCEPT AND PRINCIPLES: Object Oriented Concepts, Identifying the elements of an object model, Examples.

8 Hours

TEXT BOOKS:
1. **Software Engineering** – Pressman, Computer Science Series TATA McGraw-Hill Publications, 6th edition.

REFERENCE BOOKS:
1. **Software Engineering**- Somerville, Pearson Education, Delhi-2001.
2. **Software Engineering**- Shooman, TATA Mc Graw Hill Publications. 6th Edition.

ADVANCED FOUNDRY TECHNOLOGY

Subject Code	:	**06IP666**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
FOUNDRY MANAGEMENT:
Planning of new foundry project – basic steps involved. Computer applications in foundries, Energy conservation methods.

6 Hours

UNIT - 2
FOUNDRY MECHANIZATION: Needs for modernization and mechanization, Area of mechanization – sand reclamation etc., pollution control in foundries. Plant layout for foundries.

6Hours

UNIT - 3
CASTING DESIGN: Initial consideration in design Economic characteristics, Technical characteristics, process an alloy selection – casting process, property criteria and design, sources of design data for cast alloys. Physical design features – molding factors in casting. Design consideration at the casting stage, machining factors in casting design, Engineering aspects of casting geometry.

8 Hours

UNIT - 4
PATTERNS: Types of patterns, pattern allowance, common pattern materials, pattern layout and preparation of patterns, core prints, their

purpose, calculation of core print dimensions, Master pattern design and its use.

6 Hours

PART - B

UNIT - 5
CORE BOX DESIGN: Core and its functions, types of cores. Design of core box and its comparison with pattern. Use of CAD and CAM concept for pattern manufacturing.

6 Hours

UNIT - 6
SOLIDIFICATION OF CASTINGS: Crystallization and development of cast Structure – Nucleation. Growth and dendritic growth, Independent nucleation, Eutectic Freezing, peritectic reactions. Structure of casings – significance and practical control cast structure, grain shape and orientation, grain size, refinement and modification of cast structure. Concept of progressive and directional solidification, Solidification time and derivation of Chvorinov's equation influence of mould characteristics and cast metal. Properties of solidification, process numerical methods for heat flow

8 Hours

UNIT - 7
FEEDING OF CASTINGS:
Feeding characteristics of alloys, geometric influences on solidification. Methods of the feeding of casings – cost and concept of yield, orientations, gating technique, casting temperature and pouring speed, design and location of feeder heads. Aids to feeder head efficiency, junction of feeder head and castings, use of padding, chills and insulators.

6 Hours

UNIT - 8
CLEANING AND TESTING OF CASTINGS
Techniques for cleaning and testing of castings.

6 Hours

TEXT BOOKS:
1. **Foundry Technology** - Beeley. P.R (Buttersworth) – 2001
2. **Principles of Metal Casting** –Heine, Loper and Rosenthal, TATA McGraw Hill, 2nd Edition - 2001

REFERENCE BOOKS:
1. **Metal Casting** – ASME hand book
2. **Metal Casting Technology** - P.C. Mukerji – 1986.
3. **Principles of Solidifications** - B. Chalmers, John Willey and Inc – Co. Newyork – 1964.
4. **Metal Casting** – Principles & Practice by T.V. Raman Rao, New Age International (P) Ltd. 1st edition.

SUPPLY CHAIN MANAGEMENT

Subject Code	:	**06IP/IM71**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS: Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit. Case discussions.

8 Hours

UNIT - 2
DESIGNING THE SUPPLY CHAIN NETWORK: Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

6 Hours

UNIT - 3
FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision using decision trees. Analytical problems.

6 Hours

UNIT - 4
PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Review of inventory concepts. Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination. Impact of supply uncertainty aggregation and replenishment policies on safety inventory. Optimum level of product availability; importance factors. Managerial levers to improve supply chain profitability.

7 Hours

PART - B

UNIT - 5
SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

6 Hours

UNIT - 6

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network. Trade-off in transportation design. Tailored transportation, Routing and scheduling in transportation. International transportation. Analytical problems. Role Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

7 Hours

UNIT - 7

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

6 Hours

UNIT - 8

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of E-business in a supply chain, The E-business framework, E-business in practice. Case discussion.

3 Hours

EMERGING CONCEPTS: Reverse Logistics; Reasons, Activities, Role. RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

3 Hours

TEXT BOOK:
1. **Supply Chain Management** – 2001, Strategy, Planning & Operation. Sunil Chopra & Peter Meindl; Pearson Education Asia, ISBN: 81-7808-272-1.

REFERENCE BOOKS:
1. **Supply Chain Redesign** – **Transforming Supply Chains into Integrated Value Systems**, Robert B Handfield, Ernest L Nichols, Jr. 2002, Pearson Education Inc, ISBN: 81-297-0113-8
2. **Modelling the Supply Chain-** Jeremy F Shapiro, Duxbury 2002, Thomson Learning, ISBN 0-534-37363

MECHATRONICS

Subject Code	: **06IP72**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Definition of Mechatronics, Multi-disciplinary scenario, origins. Evaluation of Mechatronics, An over view of mechatronics, Design of mechatronics system. Measurements system and function of main elements of measurement systems. Need for mechatronics in industries. Objectives, advantages and disadvantages of mechatronics. Microprocessor based controllers. Principle of working of automatic camera, engine management system, automatic washing machine.

6 Hours

UNIT - 2
REVIEW OF TRANSDUCERS AND SENSORS: Defination and classification of transducers. (No detailed discussions on different type of transducers) Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

6 Hours

UNIT - 3
MICROPROCESSOR: Introduction, Microprocessor based digital control. Digital member system, binary and hexadecimal number system, Logic functions, Data word representation basic Elements of control systems.

6 Hours

UNIT - 4
MICROPROCESSOR ARCHITECTURE:
8085A processor architecture Terminology-such as, CPU, memory and address, ALU, assembler, data, registers, Fetch cycle, write cycle, state, bus interrupts. Micro controllers – difference between microprocessor and micro controllers. Requirements for control and their implementation in micro controllers. Classification of micro controllers.

6 Hours

PART - B

UNIT - 5
ELEMENTS OF CNC MACHINES: Structure, guideways – Friction, Autifriction and Frictionless guideways, Merits and demerits. Drives – Recirculating ball screw and nut. Advantages and disadvantages over Conventional screw and nut. Concept of stick-slip phenomenon, Concept of Preloading of ball nuts. Roller screw – planetary roller screw, recirculating roller screw. Spindle and spindle bearings in machine tool. Various types of loads encountered by spindle and spindle bearing. Types of bearings – friction, antifriction and frictionless bearing. Merits and demerits of each. Selection of spindle and spindle bearing, preloading of bearings, different method of preloading in detail.

8 Hours

UNIT - 6
ELECTRICAL ACTUATORS: Actuator and actuator system. Classifications of actuator system with examples. Mechanical switches. Concept of bouncing Methods of Preventing bouncing of mechanical switches. Solenoids, Relays. Solid state switches – Diodes, Thyristors, Triacs, Trasistors, Darlington pair. Electrical actuator. Principle, construction and working of AC, DC motors, stepper motors, permanent motors, servomotors, Servo systems and control

7 Hours

UNIT - 7
HYDRAULIC ACTUATORS: Valves – Classifications, Pressure Control Valves – Pressure relief valves, Pressure regulating/reducing valves, Pressure sequence valve. Flow control valves – Principle, needle valve, globe valve. Direction control valve –sliding spool valve, solenoid operated. Symbols of hydraulic elements. Hydraulic cylinders –constructional features, classification and applications. Hydraulic motors – Types, vane motors and piston motors, applications.

7 Hours

UNIT - 8
SINGLE CONDITIONING: Concept, necessity, op-amps, protection, filtering, wheat stone bridge – Digital Signals – Multiplexer. Data acquisition – Introduction to digital signal processing – Concepts and different methods.

6 Hours

TEXT BOOKS:
1. **Mechatronics** – Principles, Concepts and applications – Nitaigour and Premchand, Mahilik – Tata McGraw Hill -2003
2. **Mechatronics** – W. Bolton, Pearson Education Asia -2nd Edition, 2001.

REFERENCE BOOKS:
1. **Introduction to mechatronics and measurement systems** –David G. Alciatore & Michel BiHistand – Tata McGraw Hill –2000
2. **Mechatronics** – H.D. Ramachandra – Sudha Publication -2003 **Mechatronics** by HMT Ltd. – Tata McGrawHill -2000.
3. **Mechatronics System design** by Devadas Shetty and Richard A. Kark – Thomas Learining -1997.
4. **Mechatronics an Introduction** by Robert H Bishop – CRC
5. **Mechatronics systems Fundamentals** by Rolf Isermann - Springer

OPERATIONS MANAGEMENT

Subject Code	: **06IP/IM73**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
OPERATIONS MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead.

6 Hours

UNIT - 2
OPERATIONS DECISION MAKING:
Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision support systems, Economic models, Statistical models.

4 Hours

SYSTEM DESIGN AND CAPACITY:
Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

4Hours

UNIT - 3
FORECASTING DEMAND:
Forecasting objectives and uses, Forecasting variables, Opinion and Judgemental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

8 Hours

UNIT - 4
AGGREGATE PLANNING AND MASTER SCHEDULING:
Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

6 Hours

PART - B

UNIT - 5
MATERIAL AND CAPACITY REQUIREMENTS PLANNING:
Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

6 Hours

UNIT - 6
SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES:
Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.

6 Hours

UNIT - 7
SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, Minimizing the number of tardy jobs.
FLOW –SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic.
JOB-SHOP SHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

6 Hours

UNIT - 8
LEAN SYSTEMS: Characteristics of Just-in-Time operations, Pull method of materials flow, consistently high quality, small lot sizes, Uniform workstation loads, Standardized components and work methods, close supplier Ties, Flexible workforce, Line flows, Automated production, Prevention maintenance, continuous improvement

6 Hours

TEXT BOOKS:
1. **Operations Management**- Monks, J.G., McGraw-Hill International Editions, 1987.
2. **Production and Operations Management**- Pannerselvam. R, 2nd edition PHI.
3. **Productions & operations management** - Adam & Ebert.5th edition PHI

41

REFERENCE BOOKS:
1. **Modern Production/Operations Management-** Buffa, Wiely Eastern Ltd., 4th edition
2. **Production and Operations Management-** Chary, S.N, Tata-McGraw Hill., 3rd edition
3. **Operations management** - James Dilworth. PHI, 3rd edition
4. **Operations Management –** Lee J Karjewski and Larry P Ritzman, strategy and Analysis, 6th Edn, Pearson Education Asia

OPERATIONS RESEARCH

Subject Code	:	**06IP/IM74**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: OR methodology, Definition of OR, Application of OR to engineering and Managerial problems, Features of OR models, Limitation of OR. Models of OR
LINEAR PROGRAMMING: Definition, mathematical formulation, standard form, Solution space, solution – feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy. Graphical method.
6 Hours

UNIT - 2
LINEAR PROGRAMMING: Simplex method, variants of simplex algorithm – Artificial basis techniques, Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simplex method.
6Hours

UNIT - 3
TRANSPORTATION PROBLEM: Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem, Degeneracy in transportation problems, Variants in Transportation Problems, Applications of Transportation problems.
8 Hours

UNIT - 4
ASSIGNMENT PROBLEM: Formulation of the Assignment problem, unbalanced assignment problem, travelling salesman problem
6 Hours

PART - B

UNIT - 5
QUEUING THEORY:
Queuing system and their characteristics, The M/M/I Queuing system, Steady state performance analysing of M/M/1 queuing model. M/M/K/ Model

6 Hours

UNIT - 6
PROJECT MANAGEMENT USING NETWORK ANALYSIS:
Network construction, determination of critical path and duration, floats. PERT- Estimation of project duration, variance and crashing

8 Hours

UNIT - 7
REPLACEMENT ANALYSIS: Introduction, reasons for replacement, Individual Replacement of machinery or equipment with/without value of money, Group Replacement Policies, Problems.

6 Hours

UNIT - 8
GAME THEORY: Formulations of games, Two person zero sum game, games with and without saddle point, graphical solutions (2x n, mx2 game), dominance property.

6 Hours

TEXT BOOKS:
1. **Operation Research and Introduction-** Taha H A, Prentice Hall of India, 6th edition, 1999
2. **Principles of Operations Research-** Philips, Ravindram and Soleberg– Theory and Practice, PHI, 2nd Edition, 2007

REFERENCE BOOKS:
1. **Introduction to Operation Research-** Hiller and Libermann, McGraw Hill 5th edn.
2. **Operations Research,** S.D. Sharma, Kedarnath, Ramnath &Co, 1996
3. **Operations Research Theory and Application-** J K Sharma, Pearson Education Pvt Ltd ,2nd Edn, ISBN-0333-92394-4
4. **Operations Research** – Kanthi Swarup & others, Sultan chand and Sons. 1992.

SOFTWARE ENGINEERING LAB

Subject Code	:	**06IPL77**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Development of simple MIS application programs for use in : (i) Library, (ii) Bank, (iii) business shop, and (iv) Hospital, using Oracle / MS SQL Server as the back-end, and VB6.0 / Developer2000 as the front-end tools.
2. Regression and Correlation analysis using any of the statistical packages.

PART - B

3. Plotting Quality control chart using software packages.
4. Use of software package to solve Operation Research (LPP) problems.

Plotting appropriate charts and diagrams relevant to various industrial applications

CNC & ROBOTICS LAB

Subject Code	:	**06IPL78**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

Writing and execution of manual part programming using ISO codes for machining of simple parts turning, taper turning, form turning and thread cutting. Use of radius compensation, canned cycles, macros etc.
CNC milling- Writing and execution of part program for contour milling.

PART - B

Programming of robots by manual, lead through and off line methods. Use of robot programming languages to pick and place, stacking of objects in increasing or decreasing size. Palletizing operations, assembly and inspection operation etc.

Note: Minimum 14 Exercises to be conducted in this lab.
Reference books:
1. M.P. Groover Automation and Computer Integrated Manufacture Ibrahim Zeid CAD/CAM
2. Fundamentals of Machining and Machine Tools by R.K.Singal - I K International Publishing house Pvt. Ltd.
3. Robotics by Appu Kuttan K K - I K International Publishing house Pvt. Ltd

SIMULATION MODELING & ANALYSIS

Subject Code	:	**06IP751**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO SIMULATION: Simulation, advantages, Disadvantages, Areas of application, System environment, components of a system, Model of a system, types of models, steps in a simulation study.
6 Hours

UNIT - 2
SIMULATION EXAMPLES: Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples
6 Hours

UNIT - 3
GENERAL PRINCIPLES: Concepts in discrete - events simulation, event scheduling **/** Time advance algorithm, simulation using event scheduling.
6 Hours

UNIT - 4
RANDOM NUMBERS: Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Autocorrelation test, Gap test, Poker test
6 Hours

PART - B

UNIT - 5
RAMDOM VARIATE GENERATION: Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions, Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance – Rejection Techniques – Poisson Distribution, Gamma Distribution.
7 Hours

UNIT - 6
ANALYSIS OF SIMULATION DATA: Input Modelling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis

Verification and Validation of Model – Model Building, Verification, Calibration and Validation of Models.

<div align="right">**7 Hours**</div>

UNIT - 7

OUTPUT ANALYSIS: Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations

<div align="right">**7 Hours**</div>

UNIT - 8

OPTIMISATION VIA SIMULATION: Meaning, difficulty, Robust Heuristics, Random Search

APPLICATIONS: Simulation of Manufacturing and Material Handling Systems, Simulation of Computer Systems, Simulation of Plant Layout, Simulation of Project Management

SIMULATION SOFTWARE: Selection of Simulation Software, Simulation packages, Experiment and Statistical Analysis tool, Trend in Simulation Software

<div align="right">**7 Hours**</div>

TEXTBOOKS:
1. **Discrete Event system Simulation** – Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol, III Edition, Pearson Education, Asia, ISBN - 81- 7808 – 505 - 4.
2. **Systems Simulation with Digital Computer –** Narsingh Deo; PHI Publication (EEE), ISBN – 0-87692-028-8
3. **Simulation Modelling & Analysis** – Averill M Law, W David Kelton; McGraw Hill International Editions – Industrial Engineering series, ISBN – 0-07-100803-9.

ENTERPRISE RESOURCE PLANNING

Subject Code	:	**06IP/IM752**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO ERP: Introduction, Evolution of ERP, What is ERP?, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages Being used Now?
ENTERPRISE – AN OVERVIEW: Introduction, Integrated Management Information, Business modelling, Integrated Data Model.

<div align="right">**6 Hours**</div>

UNIT - 2
ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.

6 Hours

UNIT - 3
ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP. Manufacturing Resource Planning, Distribution Requirements Planning.

6 Hours

UNIT - 4
KANBAN: JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.

6 Hours

PART - B

UNIT - 5
ERP MODULES: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

6 Hours

UNIT - 6
BENEFITS OF ERP: Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

6 Hours

UNIT - 7
ERP MARKET: Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions company, System Software Associates, Inc. QAD

8 Hours

UNIT - 8
ERP IMPLEMENTATION LIFE CYCLE: Pre-evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, End user Training, Post implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.

FUTURE DIRECTION IN ERP: Introductions, New Markets, New Channels, Faster Implementation Methodologies, Business models and BAPIs, Convergence on Windows NT, Application Platforms, New business segments, web enabling, market snapshot
ERP- Case studies

8 Hours

TEXT BOOKS:
1. **Enterprise Resource Planning** -Alexis Leon, 1999, Tata Mc Graw Hill Publishing Company Ltd.,
2. **Enterprise Resource Planning Concept and Practice** -Vinod Kumar Garg and Venkitakrishnan, 2nd Edition, Prentice-Hall India.

REFERENCE TEXT BOOK:
1. Thomas Volloman , etal , Manufacturing Planning & Controls.

COMPOSITE MATERIALS

Subject Code	:	**06IP/IM753**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO COMPOSITE MATERIALS: Definition, classification and characteristics of composite materials – fibrous composites, laminated composites, particulate composites. Properties and types of reinforcement and matrix materials.

6 Hours

UNIT - 2
FIBRE REINFORCEMENT PLASTIC PROCESSING: Lay up and curing, fabricating process – open and closed mould process – hand lay up techniques – structural laminate bag molding, production procedures for bag molding – filament winding, pultrusion, pulforming, thermo – forming, injection, injection molding, liquid molding, blow modling.

7 Hours

UNIT - 3
FABRICATION OF COMPOSITES: Cutting, machining, drilling, mechanical fasteners and adhesive bonding, joining, computer aided design and manufacturing, tooling, fabrication equipment.

7 Hours

UNIT - 4
CERAMIC MATRIX COMPOSITES AND THEIR FABRICATION TECHNOLOGIES:

6 Hours

PART - B

UNIT - 5
APPLICATION OF COMPOSITES CHARACTERISATION OF COMPOSITES, COMPUTER AIDED DESIGN AND ANALYSIS OF COMPOSITES:

7 Hours

UNIT - 6
APPLICATION OF INDUSTRIAL EXPERIMENTATION FOR FABRICATION AND TESTING OF COMPOSITES:

6 Hours

UNIT - 7
STUDY PROPERTIES OF MMC'S: Physical Mechanical, wear, machinability and other properties. Effect of size, shape and distribution of particulate on properties.

6 Hours

UNIT - 8
ADVANCED COMPOSITES SUCH AS POLYMER BASED SANDWICH STRUCTURES OF NANO COMPOSITES:

5 Hours

INTRODUCTION TO SHAPE MEMORY ALLOYS:

2 Hours

TEXT BOOKS:
1. **Composite Science and Engineering** - K.K.Chawala Springer Verlag 1998.
2. **Introduction to composite materials** - Hull and Clyne, Cambridge University Press, 2nd Edition, 1990.

REFERENCE BOOKS:
1. **Composite Materials hand book-** Meing Schwaitz, McGraw Hill Book Company, 1984.
2. **Mechanics of Composite Materials-** Robert. M. Jones, McGraw Hill Kogakusha Ltd., 1998.
3. **Forming Metal hand book-** 9th edition, ASM handbook, V15, 1988, P327-338.
4. **Mechanics of composites** - Autar K kaw, CRC Press, 2002.
5. **Composite Materials** - S.C. Sharma Narora publishing house, 2000
6. **Principles of Composite Material mechanics** - Ronald. F. Gibron, McGraw Hill International, 1994.

MARKETING MANAGEMENT

Subject Code	:	**06IP/IM754**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and Macro Environment, importance of marketing in the India Socio – economics system.

6 Hours

UNIT - 2
CONSUMER MARKETS AND BUYING BEHAVIOUR: Characteristics affecting Consumer behaviour, Types of buying decisions, buying decision process, Classification of consumer products, Market Segmentation.

6 Hours

UNIT - 3
MARKETING INFORMATION SYSTEMS AND RESEARCH: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, measurement of market demand.

6 Hours

UNIT - 4
MARKETING OF INDUSTRIAL GOODS: Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behaviour, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users

6 Hours

PART - B

UNIT - 5
PRODUCT PLANNING AND DEVELOPMENT: The concept of a product, features of a product, classification of products, product policies – product planning and development, product line, product mix – factors influencing change in product mix, product mix strategies, meaning of New – product; major stages in new – product development, product life cycle.

8 Hours

UNIT - 6
BRANDING, LABELLING AND PACKAGING: Branding, Reasons for branding, functions of branding, features and types of brands, kinds of brand name.
Labelling: Types, functions, advantages and disadvantages
Packaging: Meaning, growth of packaging, function of packaging, kinds of packaging.

6 Hours

UNIT - 7
PRICING: Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions.

DISTRIBUTION: Marketing channels – functions, types of channels of distribution, number of channel levels. Physical distribution – importance, total systems concept, strategy, use of physical distribution.

8 Hours

UNIT - 8
ADVERTISING AND SALES PROMOTION: Objectives of advertisement function of advertising, classification of advertisement copy, advertisement media – kinds of media, advantages of advertising. Objectives of sales promotion, advantages sales promotion.

PERSONAL SELLING: Objectives of personal selling, establishing the Sales force objectives, sales – force strategy, sales force structure and size, salesmanship, qualities of good salesman, types of salesman, major steps in effective selling.

6 Hours

TEXT BOOKS:
1. **Principles of Marketing-** Philip Kotler, Prentice – Hall. 11th Edn.
2. **Marketing Management-** Philip Kotler, Prentice – Hall. 12th Edn.
3. **Marketing Management-** Michael R Czinkota,, 2nd Edition, Vikas Publishing House, ISBN 981-240-366-3

REFERENCE BOOKS:
1. **Fundamentals of Marketing-** William J Stanton, McGraw Hill, 1994
2. **Marketing Management** S.A Sherlaker, 1999.
3. **Marketing Management Text & Cases-** Rajagopal, Vikas Publishing House, ISBN 81-259-0773-4

TECHNOLOGY MANAGEMENT

Subject Code	:	**06IP/IM755**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
THE CONCEPT OF TECHNOLOGY: Introduction, The nature of knowledge, Aspects of classification, Concept and Meaning of technology, The character of a specific technology, Scope of technology, Examples of classification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment.

6 Hours

UNIT - 2
THE NATURE OF TECHNOLOGICAL CHANGE: Introduction, Meaning of technological change, Concept of invention, Nature of innovation, Emergence of new technologies, Life cycle of a technology, Motivation for technological change, Nature of technological progress, Nature of mature technology, Nature of diffusion, Technological convergence.

6 Hours

UNIT - 3
THE ECONOMICS OF TECHNOLOGY: Introduction, Meaning of technological economics, Examples of technological economics, Scope of technological economics, Engineering economics, Production economics, Concept of economy of scale, Concept of optimum size, Technology as a commodity, Technology at the macro-economic level.

6 Hours

UNIT - 4
CORPORATE TECHNOLOGY STRATEGY: Introduction, The business mission, Where is the business? Concept of business strategy, Capability for strategic planning, Corporate technology strategy, Competitive technology, Focus of strategy, Technological alliances, Realization of strategy, Technology crisis.

6 Hours

PART - B

UNIT - 5
ANALYSIS FOR TECHNOLOGY STRATEGY: Introduction, Technology assessment, Technology forecasting, Main techniques of technology forecasting, Technology forecasting system, Yield of technology forecasting.

9 Hours

UNIT - 6
THE REALIZATION OF NEW TECHNOLOGY: Introduction, Concept of R&D policy, Stimuli for innovation, Sources of innovation, Intelligence function of R&D, Management of R&D, R&D team, Effectiveness of R&D, Marketing aspects of R&D, Finance for Design, Development, Manufacture and Marketing, reduction of development lead time, Patterns for new technology development, Remaining a going concern.

7 Hours

UNIT - 7
THE ADOPTION OF NEW MANUFACTURING TECHNOLOGY: Introduction, manufacturing strategy, Introduction of new technology, Challenges of factory automation, Stages of factory automation, Manufacturing FMS, CIM, CAD/CAM, Intelligent manufacturing systems, operation of new technology, Change management, People and technology at work, Work structures.

6 Hours

UNIT - 8
TECHNOLOGY- AN INSTRUMENT OF COMPETITION: Introduction, securing competitive advantage, Technological competition analysis, Technological leadership, Adoption of new technology, marketing a new technology product, Retention of competitive advantages.

6 Hours

TEXT BOOK:
1. **The Management of Technology-**Paul Lowe, Perceptions & opportunities, Chapman & Hall, London, 1995.

REFERENCE BOOKS:
1. **Strategic Management of Technology-** Frederick Betz, , McGraw-Hill Inc 1993.
2. **Management of Technology & Innovation** -Rastogi, P.N. competing Through Technological Excellence, Sage Publications, 1995.

ELECTIVE III (GROUP C)

COMBINATORIAL OPTIMIZATION

Subject Code	:	**06IP/IM761**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
CLASSIFICATION OF OPTIMIZATION THEORY: Unconstrained Problems – Necessary and Sufficient Conditions, The Newton – Raphson Method, Constrain Problems – Equality Constraints, Inequality Constraints.

6 Hours

UNIT - 2
NP HARD AND NP COMPLETE PROBLEMS: Basic concepts, Non deterministic Algorithms, The classes NP Hard and NP Complete, NP Hard Scheduling Problems – Scheduling Identical Processors, Flow Shop Scheduling, Job Shop Scheduling.

6 Hours

UNIT - 3
Review of graphs and network, review of computational complexity

6 Hours

UNIT - 4
Spanning Trees

6 Hours

PART - B

UNIT - 5
Shortest Path Algorithm, Minimum Cost Network Flows, Maximum Flow Algorithm

7 Hours

UNIT - 6
MATCHING ALGORITHM: Travelling Salesmen Problem, Postman Problems, Machine Scheduling Problem.

7 Hours

UNIT - 7
META HEURISTICS: Simulated Annealing, Tabu Search

7 Hours

UNIT - 8

GENETIC ALGORITHMS: What are Genetic Algorithms?, Robustness of Traditional Optimization and Search Methods, The Goals of Optimization, How are Genetic Algorithms Different from Traditional Methods? A Simple Genetic Algorithm, Genetic Algorithms at Work – a simulation by hand, Grist for the Search Mill – Important similarities, Similarity Templates (Schemata)

7 Hours

TEXT BOOKS:
1. **Optimization Algorithms for Networks and Graphs** – Jrevans and E Mineika, 1st Edition
2. **Genetic Algorithm-** David, E.Goldberg, Pearson Education Asia. 2nd Edition
3. **Operations Research** Hamdy A Taha — 7th Edn, Pearson Education.
4. **Fundamentals of Computer Algorithms-** Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran –, Galgotia Publications. 1st Edition

REFERENCE BOOKS:
1. **Operations Research**-Ravindran, Phillips and Solberg, Wiley International, 2nd edition
2. **Operation Research–** Hiller Leiberman– Holdenday / CBS Publishers 1994 Edn.
3. **Operations Research-** S.D. Sharma –-Kedarnatth Ramanth & Co.2000

FINANCIAL MANAGEMENT

Subject Code	:	**06IP/IM762**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Evolution of Financial Management, Goals, Forms of Business.
RISK AND REQUIRED RETURN: Risk and return relationship, Business risk, financial risk, and risk in portfolio context, expected rate of return, Capital asset pricing model.

7 Hours

UNIT - 2
CAPITAL BUDGETING: Risk analysis in Capital Budgeting, Cost of Capital – Debt, Preference Equity forms of capital.
WORKING CAPITAL MANAGEMENT: Factors influencing working capital requirement, determination of operating cycle and working capital.
7 Hours

UNIT - 3
LONG TERM FINANCING: Raising of finance form primary and secondary markets, Valuation of securities, features of convertibility securities and warrants, SEBI guide lines on capital issues, stock market in India, Venture capital, Initial Public Offering.
6Hours

UNIT - 4
CAPITAL STRUCTURE AND FIRM VALUE: Assumption, Definition and approaches, Modigliani and Miller Mode, Capital Structure decisions – EBIT, EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis

DIVIDEND VALUE AND FIRM VALUE Models, Reasons for payment of dividends, Dividend Policy, Bonus shares and stock splits, Dividend policies in practice.
6 Hours

PART - B

UNIT - 5
SECURITIES AND PORTFOLIO ANALYSIS: Derivatives, Futures Trading.
6 Hours

UNIT - 6
MERGER ACQUISITION AND RESTRUCTURING: Reasons, Mechanics, Cost and benefits of a merger, Evolution, terms and purchase of a division, Takeovers, Acquisitions, Portfolio and financial restructuring.
6 Hours

UNIT - 7
INTERNATIONAL FINANCIAL MANAGEMENT: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, Raising Foreign Currency Finance, Financing Exports, Documents in International Trade, Foreign Exchange Exposure, Management of Foreign Exchange Exposure.
6 Hours

UNIT - 8
FINANCIAL MANAGEMENT IN PUBLIC SECTOR ENTERPRISES:
Capital Budgeting, Long-term Financing, Working capital Management,
Memorandum of Understanding, Financial Controls, Privatization.

8 Hours

TEXT BOOKS:
1. **Financial Management** -Theory and practice, Prasanna Chandra
   TMH ISBN– 0-07-044501-X, 5th edn.
2. **Financial accounting** -B.S. Raman, United publication VoI II

REFERENCE BOOKS:
1. **Financial Management .Tex t& Problems** -Khan & Jain, TMH
   .ISBN 0—07-460208-X
2. **Financial management** -IM Pandey. Vikas Pub. House ISBN 0-
   7069-5435-1.

PROJECT MANAGEMENT

Subject Code	:	**06IP/IM763**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
CONCEPTS OF PROJECT MANAGEMENT: Concepts of a Project,
Categories of projects, Phases of project life cycle, Roles and responsibility
of project leader, tools and techniques for project management.

6 Hours

UNIT - 2
PROJECT PLANNING AND ESTIMATING: Feasibility report, phased
planning, Project planning steps, Objective and goals of the project,
preparation of cost estimation, evaluation of the project profitability.

7 Hours

UNIT - 3
ORGANIZING AND STAFFING THE PROJECT TEAM: Skills /
abilities required for project manger, Authorities and responsibilities of
project manager, Project organization and types accountability in project
execution, controls, tendering and selection of contractors.

7 Hours

UNIT - 4
PROJECT SCHEDULING: Project implementation scheduling, effective time management, different scheduling techniques, resources allocation method.

<div align="right">**6 Hours**</div>

<div align="center">**PART - B**</div>

UNIT - 5
TOOLS & TECHNIQUES OF PROJECT MANAGEMENT: Bar (GANTT) chart, bar chart for combined activities, logic diagrams and networks, Project evaluation and review Techniques (PERT) Planning, Computerized project management

<div align="right">**8 Hours**</div>

UNIT - 6
CO-ORDINATION AND CONTROL: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance, control, schedule control, cost Control

<div align="right">**6 Hours**</div>

UNIT - 7
PERFORMANCE MEASURES IN PROJECT MANAGEMENT: Performance indicators, Performance improvement for the CM & DM companies for better project management, project management and environment.

<div align="right">**6 Hours**</div>

UNIT - 8
CASE STUDIES ON PROJECT MANAGEMENT: Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.

<div align="right">**6 Hours**</div>

TEXT BOOKS:
1. **Project Management a System approach to Planning Scheduling & Controlling**- Harold Kerzner, CBS Publishers and Distributors. 2002.
2. **Project Execution Plan: Plan for project Execution interaction-** Chaudhry S., 2001.

REFERENCES BOOKS:
1. **Project Management –** Beningston Lawrence McGraw Hill 1970.
2. A Management Guide to PERT and CPM, WEIST & LeVY Eastern Economy of PH 2002.

3. PERT & CPM.L.S.Srinnath, Affiliated East West Press Pvt. Ltd. 2002.
4. **Project Management with PERT and CPM**- Moder Joseph and Philips cerel R., 2nd edition, New York VAN Norstrand, Reinhold - 1976.
5. **Project planning analysis selection implementation & review-** prasanna chandra, ISBNO-07-462049-5   2002.
6. **Planning, Performing and Controlling-** Angus**,** Project, 3rd End, Person Education, ISBN:812970020m, .2001
7. **Project planning scheduling & control**- james P.Lawis, Meo Publishing company, 2001.
8. **Project Management-** Bhavesh M.Patel, , Vikas Publishing House, ISBN 81-259-0777-7, 2002.

CONCURRENT ENGINEERING

Subject Code	: **06IP/IM764**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
MANUFACTURING COMPETITIVENESS: Review, Product and Services, Process and Methodologies, performance, the need for change, Sequential versus concurrent Engg.,

7 Hours

UNIT - 2
PROCESS REENGINEERING: Managing change, Reengineering approaches, Enterprise models, concurrent process reengineering.

7 Hours

UNIT - 3
CONCURRENT ENGINEERING: Introduction, Basic principles, components of CE models.

6 Hours

UNIT - 4
CONCURRENT ENGINEERING: Benefits, co-operative concurrent teams, Types of CE organisations.

6 Hours

PART - B

UNIT - 5
SYSTEM ENGINEERING: Introduction, system Thinking, System complexity, System integration, Angle Virtual company.

6 Hours

UNIT – 6
INFORMATION MODELLING: Methodology, foundation of information modelling.

6 Hours

UNIT - 7
INFORMATION MODELLING: Concurrent engineering process invariant enterprise model class, product mode class, cognitive models.

6 Hours

UNIT - 8
CE METRICS FOR IT: Based manufacturing – process efficiency metrics, Process effectiveness metrics.

8 Hours

TEXT BOOK:
1. **Concurrent Engineering Fundamentals-**. Integrated Product and process organization Vol. 1 & 2, Prasad.B, Prentice Hall Englewood, Cliffs, New Jersey 1996.

REFERENCE BOOKS:
1. **Concurrent Engineering** – Hartely R John, Shortening lead times, raising quality & Lowering costs, Productivity press, Portland, Oregon 1992.
2. **Concurrent Engineering-**Carter DE & Baker BSThe product development environment for the 1990's. Addison – Wesley Publishing company, Reading MA 1992.

FACILITIES PLANNING AND DESIGN

Subject Code	:	**06IP/IM765**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PLANT LOCATION:
Factors influencing plant location, Theories of plant location and location economics. **plant layout**-Objectives of plant layout, Principles of plant layout, types of plant layout, their merits and demerits **facilities design function:** Objectives, Types of Layout Problems.

7 Hours

UNIT - 2
MATERIAL HANDLING: Objectives and principles of Material handling, Unit load concept, classification of material handling equipment basic systems, different types of material handling equipments

6 Hours

UNIT - 3
PLANT DESIGN: Layout procedures: Immer, Nadler, Muther, Apple James and Reed's approaches, systematic layout planning, activity relationship chart, relationship Diagram, Space relationship diagram to plant layout

7 Hours

UNIT - 4
COMPUTERIZED LAYOUT PLANNING: CRAFT, COFAD, PLANET, CORELAP, ALDEP

7 Hours

PART - B

UNIT - 5
SPACE DETERMINATION AND AREA ALLOCATION: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, Establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan. Sequence demand Straight line and non directional methods

7 Hours

UNIT - 6
CONSTRUCTION OF THE LAYOUT: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management

3 Hours

LOCATION MODELS: Single and Multi facility location models, Location allocation problems – quadratic assignment problems.

<div align="right">**3 Hours**</div>

UNIT - 7
QUANTITATIVE APPROACHES TO FACILITIES PLANNING: Deterministic models single and multi facility location models, Location allocation problems – quadratic assignment problem, Warehouse layout models, plant location problems.

<div align="right">**6 Hours**</div>

UNIT - 8
LAYOUT MODELS: Warehouse Layout Models, Waiting line models, Storage models – simple problems, Evaluation, selection and implementation of facilities plan

<div align="right">**6 Hours**</div>

TEXT BOOKS:
1. **Plant Layout and Material handling -**James M Apple,2nd Edition, John, Wiely and Sons
2. **Facility layout and Location** -Francies,R.L. and White,J.A., Mc Graw Hill 2nd edition

REFERENCE BOOKS:
1. **Practical layout** -Muther Richard,–Mc Graw Hill-1955.
2. **Facilities Design** -Sunderesh Heragu, , PWS Publishing Company, ISBN-0-534-95183.
3. **Plant Layout Design -**James M Moore, Mac Millon Co.1962 LCCCN61- 5204.

MANAGEMENT INFORMATION SYSTEMS

Subject Code	:	**06IP/IM766**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
FUNDAMENTALS OF INFORMATION SYSTEMS: Information systems in business, fundamentals of information systems solving business problems with information systems.

<div align="right">**6 Hours**</div>

UNIT - 2
INFORMATION SYSTEMS FOR BUSINESS OPERATIONS: Business information systems, Transaction processing systems, management information systems and decision support systems.

Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

8 Hours

UNIT - 3
ISSUES IN MANAGING INFORMATION TECHNOLOGY:
Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

8 Hours

UNIT - 4
INTRODUCTION TO E-BUSINESS: E-commerce frame work, Media convergence, Consumer applications, Organization applications.

6 Hours

PART - B

UNIT - 5
E-BUSINESS MODEL: Architectural frame work for E-commerce, Application services and transaction
Models – B2C Transactions, B2B Transactions, Intra-Organisational Transactions.

6 Hours

UNIT - 6
E-BUSINESS MODEL: WWW Architecture: Client server structure of the web, e-Commerce architecture, Technology behind the web.

6 Hours

UNIT - 7
CONSUMER-ORIENTED E-COMMERCE: Consumer oriented Application: Finance and Home Banking, Home shopping, Home Entertainment, Mercantile Process Models, Consumers perspective, Merchants perspective.

6 Hours

UNIT - 8
ELECTRONICS DATA INTERCHANGE (EDI): EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

6 Hours

TEXT BOOKS:
1. **Management Information systems**- managing information technology in the internet worked enterprise- jams. A O'Brien - Tata McGraw Hill publishing company limited, 2002.
2. **Management Information Systems** - Laaudon & Laudon PHI ISBN 81-203-1282-1. 1998.

REFERENCE BOOKS:
1. **Management Information systems**- S. Sadogopan.PHI 1998. ISBN 81-203-1180-9
2. **Information system s for modern management** - G.R. Murdick PHI, 2nd Edition.

FLUID POWER SYSTEMS

Subject Code	:	**06IP81**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO HYDRAULIC POWER & PUMPS:
Pascal's Law, structure of Hydraulic control system. **Pumps**: Pumping theory, Pump Classification, Gear Pumps, Vane Pumps, Piston Pumps, Pump performance, Pump selection.

7 Hours

UNIT - 2
HYDRAULIC ACTUATORS AND MOTORS:
Linear Hydraulic Actuators (Cylinders), Mechanics of Hydraulic Cylinder Loading, cylinder cushioning, Hydraulic Rotary Actuators, Gear Motors, Vane Motors, piston Motors, Hydrostatic Transmission – open and close circuit, Performance.

7 Hours

UNIT - 3
CONTROL COMPONENTS IN HYDRAULIC SYSTEMS:
Directional Control Valves (DCV), Constructional features, 2/2, 3/2, 4/2, 4/3 DCV, Center configuration in 4/3 DCV, Actuation of DCVs, check valve, Pilot check valve, , Pressure control valves – direct and pilot operated types, Pressure reducing valve , flow control valves, pressure compensated flow control valve, Throttle check valve.

7 Hours

UNIT - 4
HYDRAULIC CIRCUIT DESIGN AND ANALYSIS:
Control of single and Double acting Hydraulic cylinder, Regenerative circuit, Counter balance Valve application, Hydraulic Cylinder sequencing Circuits, Cylinder Synchronizing Circuits, speed Control of Hydraulic Cylinder – Meter in & Meter out, speed control of Hydraulic Motors, Accumulators and accumulator circuits.

6 Hours

PART - B

UNIT - 5
MAINTENANCE OF HYDRAULIC SYSTEMS:
Hydraulic oils – Desirable properties, General type of fluids, Sealing Devices, Reservoir system, Filters and strainers, Problem caused by Gases in

Hydraulic Fluids, Wear of Moving Parts due to Solid – Particle Contamination, Temperature control, Trouble shooting.

6 Hours

UNIT - 6
INTRODUCTION TO PNEUMATIC CONTROL: Choice of working medium. Characteristics of compressed air. Structure of Pneumatic control System, Production of compressed air -compressors, Preparation of compressed air -Driers, Filters, regulators, Lubricators, Distribution of compressed air – Piping layout.

6 Hours

UNIT - 7
PNEUMATIC ACTUATORS & VALVES: Linear Cylinder – Types, Conventional type of cylinder – working, End position cushioning, Rod less cylinders, Directional control valve, shuttle valve, Quick exhaust value, Twin pressure valve, Direct and indirect actuation of pneumatic cylinder, Use of memory valve.

7 Hours

UNIT - 8
PNEUMATIC LOGIC CIRCUITS: Use of Logic functions – OR , AND , NOR, NAND, NOT functions in pneumatic applications. Practical examples involving the use of logic functions. Pressure dependent controls – types – Construction – Practical applications. Time dependent controls – Principle, Construction, Practical applications.

6 Hours

TEXT BOOKS:
1. **Fluid Power with application's** - Anthony Esposito, Fifth edition, Pearson Education, Inc 2000.
2. **Oil Hydraulic systems** – **Principles and Maintenance** - S.R. Majumdar, Tata McGraw Hill Publishing Company Ltd. 2001.
3. **Pneumatic systems** - S. R Majumdar, Tata McGHraw Hill Publishing Co. – 1995.

REFERENCE BOOKS:
1. **Pneumatics Basic Level TP 101-** by Peter Croser & Frank Ebel, Festo Didactic publication - 1999.
2. **Fundamentals of Pneumatic Control Engineering** - J P Hasebrink & R Kobbler, Festo Didactic publication, 3rd edition – 1989.
3. **Pneumatic Control for Industrial Automation** - Peter Rohner & Gordon Smith, John Wiley Sons publication – 1989.
4. **Power Hydraulics** - Michael J Pinches & John G Ashby, Prentice Hall – 1989.

WORLD CLASS MANUFACTURING

Subject Code	:	**06IP/IM82**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO WORLD CLASS MANUFACTURING:
Manufacturing Excellence and Competitiveness, What is world-Class Manufacturing?-Hall's framework of world-Class Manufacturing (WCM), Gunn's Model of World-Class Manufacturing , Maskell's Model of World-Class Manufacturing, America's Best Plants Model of World Class Manufacturing.

6 Hours

UNIT - 2
WORLD CLASS MANUFACTURING: The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-The customers Interface ,The Supplier Interface, World-Class Practices in the factory, Quality Management, Shingo's **SIX SIGMA :**The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line , core of DFSS-IDOV method , DFSS Metrics, DFSS Infrastructure –People and resources, Implementing DFSS

7 Hours

UNIT - 3
PRINCIPLES AND PRACTICIES OF WCM: Data collection plan, research-internal public domain sources, outside experts etc. original research, site visits, and code of conduct. Analyzing the gap: Top displaying data, deciding and combining best work practices, Balance Score Card Technique, Value Stream Mapping, validation, recommendations etc

6 Hours

UNIT - 4
BENCHMARKING:
Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process. What to benchmark: concept of step zero, priorities, business processes – linking to goals etc, investigation, documentation, performance measures, improving business processes. Whom to benchmarks: Developing candidate list, systematic search, refining the initial list.

7 Hours

PART - B

UNIT - 5
DEFINITION OF REENGINEERING: Importance of 3Cs-customers takes charges, competition intensifies, and change becomes constant. Definition of Business Process Reengineering – fundamentals rethinking, radical redesign, and dramatic improvement.

6 Hours

UNIT - 6
Rethinking business process, new world of and enabling role of information technology.

QUALITY SYSTEMS:
ISO 9000-2000, IS 14000, Frame Work for Business Excellence - Malcolm Baldridge Award, Deming's Award

8 Hours

UNIT - 7
SIX SIGMA: The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line , core of DFSS-IDOV method , DFSS Metrics, DFSS Infrastructure –People and resources, Implementing DFSS

7 Hours

UNIT - 8
ACTIVITY BASED MANAGEMENT (ABM):
Introduction, Traditional Cost Systems, Activity Based activity Based Costing, Activity Based Management, ABM Implementation, Case Study.
Theory Of Constraints (TOC)
Theory of Inventive Problem Solving

5 Hours

TEXT BOOKS:
1. Hammer, Michael and James Champy. Reengineering the corporation-A Manifesto for Business revolution, Nicholas Brealey Publishing ,London.- 1993
2. **finding and Implementing Best Practices-** Business Process Benchmarking, Champ ,Robert C. Vision Books , New Delhi – 2008
3. **World Class Manufacturing- A Strategic Perspective-**Sahay B S, Saxena K B C, Ashish Kumar,: MacMillan – India Ltd, ISBN 0333-93-4741.
4. **Six sigma for Managers**- TMH 2002,Greg Brue**,,** ISBN- 0-07-048639-5

REFERENCE BOOKS:

1. **Design for Six Sigma -**Grege, TMh 2003,ISBN 0-07-058120
2. **Creveling, Design for Six Sigmain Technology and Product Development** -Pearson Education – 2008.
3. **Total Quality Management** -Dale H. Besterfield,carol Besterfield-Minchna,glen H Besterfield and Mary Besterfield –scare, ,3rd edition Pearson education, ISBN 81-297-0260-6
4. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd - 2008

TOTAL QUALITY MANAGEMENT

Subject Code	:	**06IP/IM831**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
OVERVIEW OF TOTAL QUALITY MANAGEMENT:
History of TQM. Axioms of TQM, CONTRIBUTION OF Quality Gurus –
Deming's approach, Juran,s quality trilogy, Crosby and quality treatment,
Imai's Kaizen, Ishikawa;s company wide quality control, and Fegenbaum;s
theory of TQC.

7 Hours

UNIT - 2
EVOLUTION OF QUALITY CONCEPTS AND METHODS: Quality
concepts. Development of four fatnesses, evolution of methodology,
evolution of company integration, quality of conformance versus quality of
design from deviations to weaknesses to opportunities. Future fitness's, four
revolutions in management thinking, and four levels of practice

7 Hours

UNIT - 3
FOUR REVOLUTIONS IN MANAGEMENT THINKING: Customer
focus, Continuous Improvement, Total participation, and Societal
Networking. FOCUS ON CUSTOMERS; Change in work concept
marketing, and customers.

6 Hours

UNIT - 4
CONTINUOUS IMPROVEMENT: Improvement as problem solving
process; Management by process, WV model of continuous improvement,
process control, process control and process improvement, process versus
creativity. Reactive Improvement; Identifying the problem, standard steps
and tools, seven steps case study, seven QC tools.

6 Hours

PART - B

UNIT - 5
PROACTIVE IMPROVEMENT: Management diagnosis of seven steps of
reactive improvement. General guidelines for management diagnosis of a QI
story, Discussion on case study for diagnosis of the seven steps.

Proactive Improvement; Introduction to proactive improvement, standard steps for proactive improvement, semantics, example-customer visitation, Applying proactive improvement to develop new products- three stages and nine steps.

6 Hours

UNIT - 6
TOTAL PARTICIPATION: Teamwork skill. Dual function of work, teams and teamwork, principles for activating teamwork, creativity in team processes, Initiation strategies, CEO involvement Example strategies for TQM introduction. Infrastructure for mobilization. Goal setting (Vision/ Mission), organization setting, training and E education, promotional activities, diffusion of success stories, awards and incentives monitoring and diagnosis, phase-in, orientation phase, alignment phase, evolution of the parallel organization.

6 Hours

UNIT - 7
HOSHIN MANAGEMENT: Definition, phases in hosing management-strategic planning (proactive), hoshin deployment, controlling with metiers (control), check and act (reactive). Hoshin management versus management by objective, hoshin management and conventional business planning, an alternative hoshin deployment system, hoshin management as "systems Engineering" for alignment.

6 Hours

UNIT - 8
SOCIETAL NETWORKING: Networking and societal diffusion – Regional and nationwide networking, infrastructure for networking, openness with real cases, change agents, Center for quality Management case study, dynamics of a societal learning system. TQM as learning system, keeping pace with the need for skill, a TQM model for skill development, summary of skill development.

8 Hours

TEXT BOOKS:
1. **A New American TQM Four Practical Revolutions in Management –** Shoji Shiba, Alan Graham and David Walden, "" Productivity Press, Portlans (USA), 1993.
2. **Management for Total Quality-** N Logothetis "" Prentice Hall of India, New Delhi.1994.

REFERENCE BOOKS:
1. **The Quality Improvement Hand Book-**Roger C Swanson, Publisher Vanity Books International, New Delhi, 1995.

71

2. **Total Quality Management-** N.V.R Naidu, K.M.Babu, Rajendra,", 2006
3. **Total Quality Management** -Kesavan R - I K International Publishing house Pvt. Ltd, 2008

ADVANCED JOINING PROCESSES AND NDT

Subject Code	: **06IP832**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO SPECIAL WELDING AND JOINING TECHNIQUES: Thermal spray coating – introduction, types – flame, arc & plasma spraying, selection of thermal spray coatings to preserve integrity of steels. Under water welding Need, equipment details, precautions needed.
7 Hours

UNIT - 2
Welding in space and low gravity environment – need, application of electron beam welding, laser beam welding, gas tungsten arc welding with advantage and limitations, metallurgy of low gravity welds. Welding of metal matrix composites.
7 Hours

UNIT - 3
WELDING OF PLASTICS: Need, classification, fusion welding techniques, friction welding techniques, electro magnetic welding techniques**.**
6 Hours

UNIT - 4
INTRODUCTION TO ND TESTING: Selection of ND methods, visual inspection, leaks testing Liquid penetration inspection, its advantages and limitations.
6 Hours

PART - B

UNIT - 5
MAGNETIC PARTICLE INSPECTION:
Methods of generating magnetic fields – types of magnetic particles and suspension liquids – steps in inspection – application and limitations, Eddy

72

Current Inspection : Principles, operation variables, procedure, inspection coils, and detectable discounts by the method.

7 Hours

UNIT - 6
ULTRA SONIC INSPECTION: Basic equipment characteristics of ultra sonic waves, variables in inspection, inspection methods – pulse echo A, B, C, scans, transmission, resonance techniques, transducer elements, couplents, search units, contact types and immersion types.

6 Hours

UNIT - 7
RADIOGRAPHIC INSPECTION: Principles, radiation sources, x-rays and gamma rays : x-rays tubes, radio graphic films, screens and filters, image intensifiers, technique charts, industrial radiography, electro-radiography, image quality, radiographic sensitivity, electron neutron radiography.

7 Hours

UNIT - 8
INDUSTRIAL COMPUTED TOMOGRAPHY: Basic principles, capabilities, and comparison with other NDE methods – application of ICT. Thermal inspection principles, equipment inspection methods applications.

6 Hours

REFERENCE BOOKS:
1. McGonnagle J.J., "Non-destructive testing" – garden and reach, Newyork
2. Non-destructive evaluation and quality control, Vol.17 of Metals
3. Handbook, 9th edition – Asia internal 1989.
4. Davis H.E., Troxell G.E., Wiskovil C.T., "The testing inspection of Engg. Materials", McGraw Hill.
5. ASM Handbook – Welding, brazing and soldering, Vol. 6, 2005.

KNOWLEDGE MANAGEMENT

Subject Code	: **06IP/IM833**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
ESSENTIALS OF COMPUTING: Birth of Computing, Evolution of Modern Computing, What is data?, formation Processing, Information

Technologies, Evolution of Information Systems, Evolution of Information Systems, Implementation of Organization, Organizational Learning, Traditional Organizational Information Systems, Moderns Organizational Information System, Deployment of Information System.

6 Hours

UNIT -2
QUALITY, RE-ENGINEERING METHODOLOGIES AND BUSINESS PARADIGMS: Introduction, Industrial Evolution, Quality Methodologies, Control charts, Lot sampling, Process Capability, Value Analysis, Key Characteristics, Total Quality Management – Basic Principles, TQM Structure, Hoshin, TQM Tools, Six Sigma, Re-engineering Methodologies, Business Process Re-engineering, Artificial Intelligence – beginning, Advancements, Approaches, Neural Networks, Expert Systems, Branches of AI, Emerging Business Paradigms – e-business, classification, system, anwedungen, Produkte in der Datenverbeitung, e-business and knowledge Management, Knowledge Management – The information processing paradigm, Knowledge organization.

8 Hours

UNIT -3
KNOWLEDGE MANAGEMENT – AN INSIGHT: Knowledge Management – Evolution, why now, Limitation of Existing initiatives, value of knowledge, Minimize effort duplication, sharing of best practices, enhanced innovation, imperatives, Organizational knowledge management – The need, key benefits, key benefits parameters, Organizational benefits, core implementation areas, organizational performance, implementation responsibilities, core groups involved, organization barriers, key elements, Organizational knowledge management.

6 Hours

UNIT - 4
KNOWLEDGE MANAGEMENT – AN INSIGHT: The Drivers, Knowledge based driver, technology drivers, Intra – organizational drivers, process drivers, economic drivers, Knowledge Management – Future, Global knowledge economy – characteristics of the knowledge economy, policy implications, business implications, What is knowledge Management, Organizational Knowledge Management Approaches – management structure, funding, Organizational culture and enablers, Technology infrastructure, Organizational knowledge management strategies, Components and function, Learning organization – Knowledge sources, focus on products and processes, Documentation, knowledge dissemination, Organisational learning, value-chaining, skill development.

6 Hours

74

PART - B

UNIT -5
ESSENTIALS OF KNOWLEDGE MANAGEMENT: Introduction, What is Knowledge? – Data, Information and Knowledge, Wisdom, basic Types of Knowledge, Organizational Knowledge management – types, Capital, classification, Knowledge life cycle, Sources, processes, Knowledge Conversion – Organizational knowledge progression, Organizational knowledge management – technology enablers, organizational intellectual / human capital organizational meta knowledge.

6 Hours

UNIT - 6
KNOWLEDGE MANAGEMENT TECHNIQUES, SYSTEMS AND TOOLS: Introduction, Organizational Knowledge creation – Knowledge networks, Organizational knowledge mapping techniques, core implementation issues, usage, Organizational knowledge spiral, Organizational Knowledge / capture – Implementation methodology, Knowledge Acquisition Tools, Organizational Knowledge indexing, processing, Document Management System, Database Management Systems Data warehouse, Knowledge Analysis – Data mining, On-line analytical processing, Organizational knowledge dissemination.

6 Hours

UNIT - 7
ORGANIZATION KNOWLEDGE MANAGEMENT ARCHITECTURE AND IMPLEMENTATION STRATEGIES: Introduction, Developing a KM Framework, Implementation Phases, Architectural Components, KM Systems Requirements, Tools, KM Systems Components – Implementation Strategies – Awakening phase, Actionable phase, Implementation phase, maintenance and measurement phase, Organizational Organic capabilities architecture – business, Information, Data, Systems, Computer, Layered Knowledge. Organizational knowledge management architecture – key considerations, Organizational knowledge Repositories – structure, Life cycle, Organizational knowledge refineries, KM applications – Integrative application Interactive application, knowledge processing applicants management, composite application, organizational KM context, Organizational platforms – Enterprises information portals, competitive advantages, enterprise knowledge portal, characteristics, Organizational knowledge measurement framework - Awakening stage, actionable phase, implementation phase, Support phase, Organizational deployment, Organisational knowledge Measurement Techniques – Intangible Assets measurement, intangible Assets Monitor, balanced Scorecard, organizational implementation barriers.

8 Hours

75

UNIT - 8
K-CAREERS: Introduction, Knowledge Management roles, New organizational roles, Organisational k-role classification, Knowledge management job opportunities – knowledge job approach, generic role requirements, role description, Knowledge architect, Knowledge strategist, Knowledge manager, Research analyst / manager, knowledge management consultant, media specialist, senior market intelligence librarian, ontologies/knowledge engineer, knowledge management specialist, intranet developer / knowledge management content developer, knowledge management director, director of ontologies, ontologist (biological domain), natural language processing specialist (medical/biomedical), knowledge development manager.

6 Hours

TEXT BOOKS:
1. **Knowledge Management-** Sudhir Warier, Vikas Publishing House, ISBN: 81-259-1363-7. 1st Edition.

REFERENCE BOOK:
1. **Knowledge Management Toolkit-** Amrit Tiwana, Practical Techniques for Building a Knowledge Management System, Prentice Hall, 1999
2. **An investigationof Knowledge Management characteristics-** Joshi K exington,KY,1998
3. **Hand book on Knowledge Management-** C W Holsapple, Springer, 2003 Porter M Competitive Advantage, Free Press, 1985

DESIGN OF EXPERIMENTS

Subject Code	:	**06IP/IM834**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION:
History of quality engineering: Japan versus U.S. track records. Taguchi Approach to Quality: Definition of quality. Loss function. Off-line and on-line quality control. Taguchi's quality philosophy.

6 Hours

UNIT - 2
BASIC DESIGNS: Completely Randomised Design, Randomised Block Design, Latin Square Designs, one way analysis of variance and two way analysis of variance.
6 Hours

UNIT - 3
FACTORIAL EXPERIMENTATION-TWO LEVELS: Full Factorial Designs: Experimentation as a learning process. Traditional scientific experiments. Two-factor design. Four-factor design, Replicating experiments. Factor interactions.
6 Hours

UNIT - 4
FACTORIAL EXPERIMENTATION-EIGHT AND SIXTEEN RUN EXPERIMENTS: Fractional factorial designs based on eight-run experiments, Folding over an eight run and sixteen – run experiment
6 Hours

PART - B

UNIT - 5
CONSTRUCTING ORTHOGONAL ARRAYS: Counting degrees or freedom, selecting a standard orthogonal array, dummy level technique, and compound factor method. Linear graphs and interaction assignment. Modification of linear graphs, column merging method, branching design. Strategy for constructing an orthogonal array. Comparison with the classical statistical experiment design.
7 Hours

UNIT - 6
STEPS IN ROBUST DESIGN: case study discussion. Noise factors and testing conditions. Quality characteristics and objective functions. Control factors and their levels. Matrix experiment and data analysis plan. Conducting the matrix experiment, data analysis, verification experiment and future plan.
7 Hours

UNIT - 7
SIGNAL-TO-NOISE RATIO FOR STATIC PROBLEMS: Evaluation of sensitivity to noise. S/N ratios for Smaller-the-better, Larger-the-better, Nominal-the-best and Asymmetric Cases
7 Hours

UNIT - 8
SIGNAL-TO-NOISE RATIO FOR DYNAMIC PROBLEMS: S/N ratios for Continuous-continuous, continuous-digital, digital-continuous, digital-digital cases. Introduction to Taguchi Inner and Outer Arrays

7 Hours

TEXT BOOKS:
1. **Quality Engineering Using Robust Design-**Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, New Jersey 07632.
2. **Design of Experiments-** D.C. Montgomery, John Wiley and Sons, 2002.

REFERENCE BOOK:
1. **Designing for Quality** -an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design**-**Robert H. Lochner and Joseph E. Matar, Chapman and Hall Madras, 2nd edition.

ADVANCED OPERATIONS RESEARCH

Subject Code	: **06IP/IM835**	IA Marks	:	25
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 52	Exam Marks	:	100

PART - A

UNIT - 1
LINEAR PROGRAMMING: Two phase simplex techniques, Revised simplex techniques.

6 Hours

UNIT - 2
ADVANCED LINEAR PROGRAMMING: Sensitivity analysis, Integer Programming, Gomory's techniques.

8 Hours

UNIT - 3
SPECIAL TYPE OF LPP: Solutions of Assignment and Travelling salesman problems using Branch and Bound Approach.

GOAL PROGRAMMING: Introduction and simple formulation.

6 Hours

UNIT - 4
NON-LINEAR PROGRAMMING: Kuhn – Tucker conditions, QPP Problems solution using Wolfes algorithm

6 Hours

PART - B

UNIT - 5
DYNAMIC PROGRAMMING: Characteristics and DP model, Computational procedure (no problem solving, only formulation)

6 Hours

UNIT - 6
ADVANCED CPM TECHNIQUES: CPM - Elements of crashing, least cost project scheduling. Flow in networks; Determination of shortest route, Determination of Maximum flow through the networks, Minimal Spanning Tree. Resource Allocation for optimal utilisation of resources

8 Hours

UNIT - 7
QUEING THEORY: M/Ek/1, M/D/1, M/M/C and MG1

6 Hours

UNIT - 8
MARKOV CHAINS: Discrete Stochastic Process, Markovian process, Stationary Markov chains, Markov diagrams, Ergodic and Absorbing Markov chains, Steady State probabilities, stochastic matrix, transition m, matrix and their applications.

6 Hours

TEXT BOOKS:
1. **Operation Research and Introduction-** Taha H A, Prentice Hall of India, 6th edition, 1999
2. **Principles of Operations Research – Theory and Practice** - Philips, Ravindram and Soleberg-, PHI, 2nd Edition, 2007

REFERENCE BOOKS:
1. **Introduction to Operation Research**- Hiller and Libermann, , McGraw Hill 5th edn.
2. **Operations Research**- S.D. Sharma , Kedarnath, Ramnath &Co, 1996
3. **Operations Research Theory and Application**- J K Sharma, , Pearson Education Pvt Ltd ,2nd Edn, ISBN-0333-92394-4
4. **Operations Research** -Kanthi Swarup & others –, Sultan chand and Sons. 1992.

DATA BASE MANAGEMENT SYSTEM

Subject Code	:	**06IP/IM836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
DATABASES AND DATABASE USERS: Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach.

2 Hours

DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE: Data models, Schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of data base management systems.

5 Hours

UNIT - 2
DATA MODELING: High level conceptual data models for database design. Entity types, entity sets, attributes, and keys. Relationships, relationship types, roles, and structural constraints. Weak entity types. ER diagrams

6 Hours

UNIT - 3
RECORD STORAGE AND PRIMARY FILE ORGANIZATIONS: Secondary storage devices, buffering of blocks, placing file records on disk, operations on files, heap files and sorted files, hashing techniques.

6 Hours

UNIT - 4
INDEX STRUCTURE OF FILES: Single-level and multilevel ordered indexes, dynamic multi level indexes using B-trees and B+trees.

6 Hours

PART - B

UNIT - 5
RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA: Brief discussion on **Codd** rules, relational model concepts, constraints, and schemas. Update operation on relations, basic and additional relational algebra operations, and queries in relational algebra.

Structured Query Language (SQL): Data definition etc. in SQL2. Basic and complex queries in SQL. Insert, delete, update statements, and views in SQL, embedded SQL.

9 Hours

UNIT - 6
DATABASE DESIGN: Design guidelines for relational schemes, functional Dependencies, normalization -1st, 2nd, 3rd, 4th, and 5th normal forms. Database design process, factors influencing physical database design guidelines, and guidelines for relational systems.

6 Hours

UNIT - 7
SYSTEM IMPLEMENTATION: System catalog for RDBMSs, transaction processing and system concepts, properties of transactions, brief discussion on concurrency, control and recovery techniques, database security and authorization.

6 Hours

UNIT - 8
BRIEF DISCUSSION ON: Distributed databases, Objected oriented databases, next generation databases, and interfacing with other technologies.

6 Hours

TEXT BOOKS:
1. **Fundamentals of database systems-** Ramez Elmasri and Shamkanth B. Navathe, 6th Edition, Addison Wesley Publishing Company.
2. **Database Management System**-Raghu Ramakrishnan and Johannes Gehrke,3rd Edition, TATA McGraw Hill, ISBN 0-07-1231511

REFERENCE BOOKS:
1. **Modern Data base management** - Mc Lfadden, hoffer, Prescott
2. **Database Management and Design-** Gary W. Hansen and James V. Hanesn , 2nd Edition, PHI Pvt. Ltd.

ENGINEERING SYSTEM DESIGN

Subject Code	:	**06IP841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: What is Designing?; Early Man as a Designer; Design by evolution;
Examples; Inadequacy of Evolutionary Method in Modern Design Situation; Systems Approach to Engineering Problems.

3 Hours

THE DESIGN PROCESS: The Structure of the Design Process; Morphology of Design; Design Process-Decision Making and Iteration.

3 Hours

UNIT - 2
IDENTIFICATION AND ANALYSIS OF NEED:
Realization of Need; preliminary Need Statement; Analysis of Need Specifications; standards of Performance; Environmental factors; Resources and Constraints; Examples.

6 Hours

UNIT - 3
ORIGINATION OF DESIGN CONCEPTS: Solving the Design Problem-Creativity; The Creative Attitude; The Creative Process; Mental Fixity; Creativity by Analogy with Systems; Use of Check Lists.

6 Hours

UNIT - 4
SOME DESIGN METHODS:
Strategies for Search for Design Concepts; Morphological Analysis; Analysis of Interconnected Decision Area; Brain Storming; Synectics; Examples to Demonstrate the use of Each Technique.

7 Hours

PART - B

UNIT - 5
THE DESIGN DECISION: The Place of Decision Making in Designing, A Measure of Physical Realizability- Example; Economic and Financial

Feasibility; The Quality of Design; The concept of utility; Using Utility for Design Selection; Multi-Criteria Decisions; Decision Making Under conditions of Chance Variation.

7 Hours

UNIT - 6
DEVELOPMENT OF DESIGN: From Concept to Product; Designing for Function; Designing for Production, Designing for Shipping, Handling; and Installing; Designing for Use; Designing for Maintenance; Compatibility Analysis; The Detailed Design.

6 Hours

UNIT - 7
ECONOMICS, OPTIMIZATION AND RELIABILITY IN ENGINEERING DESIGN (NO NUMERICAL PROBLEMS): Place of Economics in Design; Quick Revision of Economic Concepts such as Fixed costs, Variable Costs, BEP; Designing for Profit; Need for Optimization; Quick revision of Optimization through Linear Programming.

6 Hours

UNIT - 8
RELIABILITY:
Introduction; A Measure of Reliability; Reliability of Assembled Systems – Series, Parallel, and their Combination;

3 Hours

HUMAN FACTORS IN DESIGN: Introduction; Man-Machine Interface; Displays and controls; actors influencing their Design; Examples.

5 Hours

TEXT BOOKS:
1. **An introduction to engineering Design Methods-** Vijay Gupta and P.N. Murthy; Tata Mc Graw Hill Publishing company Limited. 1997.
2. **The Creative Problem Solver's Tool box – A complete Course in the Art of Creating Solutions to Problems of any kind** Richard Fobes, , University Press, 1999.

REFERENCE BOOK:
1. **How to be better at Creativity? The industrial Society. Master mind book** -Geoffrey Petty;, Indian edition, 1998

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Subject Code	:	**06IP/IM842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
ARTIFICIAL INTELLIGENCE: Introduction, definition, underlying assumption, important of AI, AI & related fields State space representations, defining a problem, production systems and its characteristic, search and control strategies – Introduction, preliminary concepts, examples of Search problems.

6 Hours

UNIT - 2
UNIFORMED OR PRELIMINARY CONCEPTS: Examples of search problems, Uniformed or Blind Serach, Informed Search, Or Graphs, Heuristic Search techniques – Generate and Test, Hill climbing, best first search, problem reduction, constraint satisfaction, Means – Ends Analysis.

8 Hours

UNIT - 3
KNOWLEDGE REPRESENTATION ISSUES: Representations and Mapping, Approaches, Issues in Kr, Types of Knowledge procedural Vs Declarative, Logic programming, Forward Vs Backward reasoning, Matching, Non monotonic reasoning and it logic.

6 Hours

UNIT - 4
USE OF PREDICATE LOGIC: Representing simple facts, Instance and is a relationships, Syntax and Semantics for Propositional logic, FOPL, and properties of Wffs, conversion to causal form, Resolution, Natural deduction

6 Hours

PART - B

UNIT - 5
STATISTICAL AND PROBABILISTIC REASONING: Symbolic reasoning under uncertainly, Probability and Bayes' theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster – Shafer Theory, Fuzzy Logic

8 Hours

UNIT - 6
EXPERT SYSTEMS: Introduction, Structure and uses, Representing and using domain knowledge, Expert System shells. Pattern recognition, introduction, Recognition and classification process, learning classification patterns, recognizing and understanding speech.

6 Hours

UNIT - 7
INTRODUCTION TO KNOWLEDGE ACUQISTION: Types of learning, General learning model, and performance measures.

6 Hours

UNIT - 8
TYPICAL EXPERT SYSTEMS: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF etc.
INTRODUCTION TO MACHINE LEARNING: Perceptons, Checker Playing examples, Learning, Automata, Genertic Algorithms, Intelligent Editors.

6 Hours

TEXT BOOKS:
1. **Artificial intelligence** – Elaine Rich & Kevin Knight, M/H 1983.
2. **Artificial intelligence in business, Science & Industry** – Wendry B.Ranch, Vol II application, Ph 1985.
3. **A.guide to expert sysems –** waterman, D.A., Addison – wesley inc. 1986.
4. **Building expert systems** – Hayes, Roth, Waterman, D.A (ed), AW 1983.
5. **Designing expert sysems** – weis, S.M. and Kulliknowske, London Champion Hull 1984.

JUST IN TIME MANUFACTURING

Subject Code	:	**06IP/IM843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
JIT-AN INTRODUCTION:
Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, creating continuous manufacture, enabling JIT to occur, basic element of JIT, benefits of JIT.

6 Hours

UNIT - 2

MODERN PRODUCTION SYSTEM: Key feature of Toyota's production system, basic framework of Toyota production system. **KANBAN SYSTEM** – other types of kanban's, kanban rules, adapting to fluctuations in demand through kanban, whirligig, determining the number of kanban's in Toyota production system, detailed kanban system example, supplier kanban and the sequence schedule for use by suppliers.

6 Hours

UNIT - 3

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM:
production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line to realize smoothed production, Criticism of Toyota production system by the communist party of Japan. EDP system for support of the Toyota Production system. Shortening lead time in Toyota Production system – reducing the setup time. Automation in Toyota production system, some comparisons with other manufacturers.

6 Hours

UNIT - 4

GLOBAL IMPLEMENTATION OF JIT:
JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, JIT in service and administrative operations, conclusion.

6 Hours

PART - B

UNIT - 5

JIT IMPLEMENTATION SURVEYS:
JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time production in Hong Kong electronics indu8stry, conclusion.

6 Hours

UNIT - 6

DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system with conventional "push type" planning and control systems, quality management system for JIT, product design for JIT human resource management in JIT, flexible workforce system at Toyota, creation and maintenance of teams for

86

JIT, union organization and conduct of industrial relations in JIT, interface of JIT with advanced manufacturing technology, assessing performance in JIT manufacturing systems, product costing information systems in JIT manufacturing, an example of overhead allocation in JIT, potential for developing countries, potential for small manufacturing.

9 Hours

UNIT - 7
SUPPLY MANAGEMENT FOR JIT:
JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, Quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing, frequency of shipments, inventory policy, supplier reaction capability, quality, communication sole sourcing, delivery performance and supplier flexibility, conclusion.

7 Hours

UNIT - 8
FRAMEWORK FOR IMPLEMENTATION OF JIT:
Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion.

6 Hours

TEXT BOOKS:
1. **Just In Time Manufacturing-** M.G. Korgaonker, Macmillan India Ltd.- 1992,
2. **Japanese Manufacturing Techniques** -Richard J. Schonberger, The Free Press – Macmillan Pub. Co., Inc. New York - 1988.

<center>**DECISION SUPPORT SYSTEMS**</center>

Subject Code	:	**06IP/IM844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

<center>**PART - A**</center>

UNIT - 1
DECISION SUPPORT SYSTEMS: An Overview, Opening Vignette: Evaluating the Quality of Journals in Hong Kong, DSS Configuration, What is a DSS? Characteristics and Capabilities, Components of DSS, The Data Management Subsystem.

<div align="right">**6 Hours**</div>

UNIT - 2
DECISION SUPPORT SYSTEMS: The Model Management Subsystem, The Knowledge-Based Management Subsystem, The User Interface (Dialog) Subsystem, The User, DSS Hardware, Distinguishing DSS from Management Science and MIS, DSS Classifications.

<div align="right">**7 Hours**</div>

UNIT - 3
DATA WAREHOUSING, ACCESS, ANALYSIS, MINING AND VISUALIZATION: Opening Vignette: OBI Makes the best out of the Data Warehouse, Data Warehousing, Access, Analysis and Visualization, The Nature and Sources of Data, Data Collection, Problems and Quality, The Internet and Commercial Database Services.

<div align="right">**6 Hours**</div>

UNIT - 4
DATA WAREHOUSING, ACCESS, ANALYSIS, MINING AND VISUALIZATION: Database management Systems in DSS, Database Organization and Structures, Data Warehousing, OLAP: Data Access, Querying and Analysis, Data Mining, Data Visualization and Multidimensionality, Geographic Information Systems and Virtual Reality, business Intelligence and the Web.

<div align="right">**7 Hours**</div>

<center>**PART - B**</center>

UNIT - 5
MODELING AND ANALYSIS: Opening Vignette: Dupont Simulates Rail Transportation System and Avoids Costly Capital Expense, Modeling for

<center>88</center>

MSS, Static and Dynamic Models, Treating Certainty, Uncertainty and Risk, Influence Diagrams, MSS Modeling in Spreadsheets.

6 Hours

UNIT - 6
MODELING AND ANALYSIS: Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees), Optimization via Mathematical Programming, Heuristic Programming, Simulation, Multidimensional modelling – OLAP, Visual interactive Modeling and Visual Interactive Simulation, Quantitative Software Package – OLAP,. Model Base Management.

7 Hours

UNIT - 7
DECISION SUPPORT SYSTEM DEVELOPMENT: Opening Vignette: Osram Sylvania Thinks Small, Strategizes Big Develops the Info Net HR Portal System, Introduction to DSS Development, The Traditional System Development Life Cycle, Alternate Development Methodologies, Prototyping:

6 Hours

UNIT - 8
DECISION SUPPORT SYSTEM DEVELOPMENT: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team – Developed DSS, End User-Developed DSS, Developing DSS: Putting the System Together, DSS Research Directions and the DSS of the Future.

7 Hours

TEXT BOOK:
1. **Decision Support Systems and Artificial Intelligence** -Efraim Turban, Jay E Aronson, , 6th Edn, Pearson Education, ISBN – 81-7808-367-1

AUTOMATION IN MANUFACTURE

Subject Code	:	**06IP/IM845**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION:
Definition of automation, reasons for automating, arguments for and against automation.

6 Hours

UNIT - 2
PRODUCTIVITY CONCEPTS, MATHEMATICAL MODELS:
Manufacturing lead-time, components of operating time, utilization and availability, work-in-process, comments on the production concept, automation strategies

6 Hours

UNIT - 3
HIGH VOLUME PRODUCTION SYSTEM: Analysis of automated flow lines, assembly and line balancing of automated assembly systems.

8 Hours

UNIT - 4
COMPUTERISED MANUFACTURING PLANNING SYSTEMS:
Computer aided process planning, implementation considerations, Survey of process planning systems like CAM_I, CAPP, MIPLAN, and MULTICAPP, AUTAP, CPPP. Etc.

8 Hours

PART - B

UNIT - 5
AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEM:
Types of material handling systems, automated conveyor system, automated guided vehicle system.

6 Hours

UNIT - 6
Computer Networks for Manufacturing:
Hierarchy of computers in manufacturing local area networks, manufacturing automation control

6 Hours

UNIT - 7
INSPECTION TECHNOLOGIES: Inspection Metrology, contact Vs Non contact Inspection Technique conventional measuring and gauging techniques, coordinate measuring machines, machine vision**.**

6 Hours

UNIT - 8
THE FUTURE AUTOMATED FACTORY: Trends in manufacturing, the future automated factory, the social impact automated systems.

6 Hours

TEXT BOOKS:
1. **Automation, Production Systems and Computer Integrated Manufacturing**- Mikell P. Groover, PHI, New Delhi – 2003.

REFERENCE BOOKS:
1. **CAD/CAM-** Mikell P. Groover and Emory W.Zimmers, PHI, New Delhi – 1994.
2. **Numerical Control and Computer aided Manufacture**, Pressman and Williams PHI - 1991
3. **An Introduction to Automated Process Planning System,** Tiess Chieu Chang and Richard A Wysk PHI – 2002.

PRODUCT DESIGN & MANUFACTURING

Subject Code	:	**06IP846**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO PRODUCT DESIGN: Asimow's Model: definition of Product Design, Design by Evolution, Design by Innovation, Essential Factors of Product Design, Production-Consumption Cycle, Flow and Value Addition in the Production – Consumption Cycle, The Morphology of Design (The seven phases), Primary Design Phases and flowcharting, Role of Allowance, Process Capability, and Tolerance in Detailed Design and Assembly.

6 Hours

UNIT - 2
PRODUCT DESIGN PRACTICE AND INDUSTRY: Induction, Product Strategies, Time to Market, Analysis of the Product, The Three S's, Standardization, Renard Series (Preferred Numbers), Simplification, The Designer and His Role, The Designer: Myth and Reality, The Industrial design Organization, Basic Design Considerations, Problems faced by industrial! Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers, what the Designer contributes, Role of Aesthetics in Product Design, Functional Design Practice.

6 Hours

UNIT - 3
REVIEW OF STRENGTH, STIFFNESS AND RIGIDITY CONSIDERATIONS IN PRODUCT Design: Principal Stress Trajectories (Force-Flow Lines), Balanced Design, Criteria and Objectives of Design, material Toughness: Resilience, Designing for Uniform Strength, Tension vis-à-vis Compression.
DESIGN FOR PRODUCTION –METAL PARTS: Producibility Requirements in the Design of Machine Components, Forging Design, Pressed Components Design, Casting Design, Design for Machining Ease, The Role of Process Engineer, Ease of Location and Clamping, Some Additional Aspects of Production Design, Die Casting and Special Casting and Special Casings, Design for Powder Metallurgical Parts, Expanded Metals and Wore Forms.

8 Hours

UNIT - 4
DESIGNING WITH PLASTICS, RUBBER, CERAMICS AND WOOD:
Approach to Design with Plastics, Plastics, Plastic Bush Bearings, Gears in Plastic, Fasteners in Plastic, Rubber Parts, Design Recommendations for Rubber Parts, Distortion in Rubber, Dimensional Effects, Tolerances, Ceramics and Glass Parts, Production Design Factors for Ceramic Parts, Special Considerations for Design Glass Parts, dimensional Factors and Tolerances, Wood.

6 Hours

PART - B

UNIT - 5
OPTIMIZATION IN DESIGN: Introduction, Siddal's Classification of Design Approaches, Optimization by differential Calculus, Lagrange Multipliers, Linear Programming (Simplex Method), Geometric Programming, Johnson's Method of Optimum Design.

6 Hours

UNIT - 6
ECONOMIC FACTORS INFLUENCING DESIGN: Product Value, Design for Safety, Reliability and Environmental Considerations, Manufacturing Operations in relation to Design, Economic Analysis, Profit and Competitiveness, Break-even Analysis, Economics of New Product Design (Samuel Eilon Model).

6 Hours

UNIT - 7
HUMAN ENGINEERING CONSIDERATIONS IN PRODUCT DESIGN: Introduction, Human being as Applicator of Forces, Anthropometry: man as Occupant of Space, The Design of Controls, The Design of Displays, Man/Machine Information Exchange.

MODERN APPROACHES TO PRODUCT DESIGN: Concurrent Design, Quality Function Deployment (QFD).

7 Hours

UNIT - 8
VALUE ENGINEERING AND PRODUCT DESIGN: Introduction, Historical Perspective, What is Value? Nature and Measurement of Value, Maximum Value, Normal Degree of Value, Importance of Value, The Value Analysis Job Plan, Creativity, Steps to Problem-solving and Value analysis, Value Analysis Test, Value Engineering Idea Generation Check-list, Cost Reduction through Value Engineering Case Study on Tap Switch Control Assembly, material and Process Selection in Value Engineering.

7 Hours

TEXT BOOKS:

1. **Product Design and Manufacturing** -- A.C. Chitale and R.C. Gupta, PHI.
2. **Product Design & Development** –Karl T. Ulrich & Steven D., Epinger Tata Mc Graw Hill, 3rd Edition, 2003

REFERENCE BOOKS:

1. **New Product Developmen**t - Tim Jones, Butterworth Heinmann, Oxfor, UIC -1997.
2. **New Product Development**- **Design & Analysis** - Roland Engene Kinetovicz, John Wiley and Sons Inc., N.y. -1990.
3. **Product Design for Manufacture and Assembly** - Geofferry Boothroyd, Peter Dewhurst and Winston Knight.
4. **Successful Product Design** - Bill Hollins, Stwout Pugh, Butterworth, London - 1990.
5. **Design for Assembly, a Designer's Hand book**-Boothroyod & Dewhurst P., University of Massachusets, Amherst - 1983.
6. **Product Design** - Kevin otto and Kristini wood Pearson Education 2004.

♣ ♣ ♣ ♣ ♣ ♣ ♣