

SCHEME OF TEACHING AND EXAMINATION 2010-2011
B.E INDUSTRIAL & PRODUCTION ENGINEERING
III SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract		IA	Theory/ Pract.	Total
1	10MAT31	Engineering Mathematics – III	Maths	04	---	03	25	100	125
2	10ME32A / 10ME 32B	Material Science & Metallurgy / Mechanical Measurements & Metrology	ME/IP/ IM	04	---	03	25	100	125
3	10ME33	Basic Thermodynamics	ME/IP/ IM	04	---	03	25	100	125
4	10ME34	Mechanics of Materials	ME/IP/ IM	04	---	03	25	100	125
5	10ME 35	Manufacturing Processes-I	ME/IP/ IM	04	---	03	25	100	125
6	10ME 36A / 10ME36B	Computer Aided Machine Drawing/ Fluid Mechanics	ME/IP/ IM	01 04	03	03	25	100	125
7	10MEL37A/ 10MEL 37B	Metallography & Material Testing Lab/ Mechanical Measurements & Metrology Lab	ME/IP/ IM	---	03	03	25	50	75
8	10MEL38A/ 10MEL 38B	Foundry & Forging Laboratory/ Machine Shop	ME/IP/ IM	---	03	03	25	50	75
Total				21/24	09	-	200	700	900

SCHEME OF TEACHING AND EXAMINATION 2010-2011
B.E INDUSTRIAL & PRODUCTION ENGINEERING
IV SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract	Duration (Hrs)	Marks		
							IA	Theory/ Pract.	Total
1	10MAT41	Engineering Mathematics – IV	Maths	04	---	03	25	100	125
2	10ME42A / 10ME 42B	Material Science & Metallurgy / Mechanical Measurements & Metrology	ME/IP/ IM	04	---	03	25	100	125
3	10ME43	Applied Thermodynamics	IP/IM	04	---	03	25	100	125
4	10ME44	Kinematics of Machines	ME/IP/ IM	04	---	03	25	100	125
5	10ME 45	Manufacturing Processes-II	ME/IP/ IM	04	---	03	25	100	125
6	10ME 46A / 10ME46B	Computer Aided Machine Drawing/ Fluid Mechanics	ME/IP/ IM	01 04	---	03	25	100	125
7	10MEL47A/ 10MEL 47B	Metallography & Material Testing Lab/ Mechanical Measurements & Metrology Lab	ME/IP/ IM	---	03	03	25	50	75
8	10MEL48A/ 10MEL 48B	Foundry & Forging Laboratory/ Machine Shop	ME/IP/ IM	---	03	03	25	50	75
Total				21/24	06	-	200	700	900

SCHEME OF TEACHING AND EXAMINATION 2010-2011
B.E INDUSTRIAL & PRODUCTION ENGINEERING
V SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract	Duration (Hrs)	Marks		
							IA	Theory / Pract.	Total
1	10AL51	Management & Entrepreneurship	IP/IM	04	-	03	25	100	125
2	10IP/IM 52	Engineering Economy	IP/IM	04	-	03	25	100	125
3	10IP/IM 53	Work Study and Ergonomics	IP/IM	04	-	03	25	100	125
4	10IP/IM 54	CAD / CAM	IP/IM	04	-	03	25	100	125
5	10IP/IM 55	Design of Machine Elements	IP/IM	04	-	03	25	100	125
6	10IP 56	Hydraulics and Pneumatics	IP	04	-	03	25	100	125
7	10IPL 57	Mechanical and Fluid Power Lab	IP	-	03	03	25	50	75
8	10IPL/IML 58	Work Study and Ergonomics Lab	IP/IM	-	03	03	25	50	75
Total				24	06	-	200	700	900

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B.E INDUSTRIAL & PRODUCTION ENGINEERING
VI SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract	Duration (Hrs)	Marks		
							IA	Theory/ Pract.	Total
1	10IP /IM 61	Materials Management	IP/IM	04		03	25	100	125
2	10IP/IM 62	Quality Assurance and Reliability	IP/IM	04		03	25	100	125
3	10IP/IM 63	Operations Research	IP/IM	04		03	25	100	125
4	10IP 64	Tool Engineering & Design	IP	04		03	25	100	125
5	10IP 65	Computer Integrated Manufacturing	IP	04		03	25	100	125
6		Elective I (Group A)	IP/IM	04		03	25	100	125
7	10IPL/ IML 67	CAD/CAM Lab	IP/IM		03	03	25	50	75
8	10IPL 68	Machine Tools Lab	IP		03	03	25	50	75
Total				24	06	-	200	700	900

Elective I (Group A)

Sl. No.	Subject Code	Subject	Sl. No.	Subject Code	Subject
1	10IP / IM 661	Value Engineering	4	10IP / IM 664	Human Resource Management
2	10IP / IM 662	Theory of Metal Forming	5	10IP 665	Analysis of Manufacturing Processes
3	10IP / IM 663	Finite Element Method			

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VII SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract	Duration (Hrs)	Marks		
							IA	Theory/ Pract.	Total
1	10IP/IM 71	Total Quality Management	IP/IM	04		03	25	100	125
2	10IP/IM 72	Operations Management	IP/IM	04		03	25	100	125
3	10IP73	Non Conventional Machining Processes	IP	04		03	25	100	125
4	10IP 74	Mechatronics	IP	04		03	25	100	125
5		Elective II (Group B)	IP/IM	04		03	25	100	125
6		Elective III (Group C)	IP/IM	04		03	25	100	125
7	10IPL 77	Software Applications Lab	IP	-	03	03	25	50	75
8	10IPL 78	CNC and Robotics Lab	IP	-	03	03	25	50	75
Total				24	06	--	200	700	900

Elective II (Group B)			Elective III (Group C)		
Sl. No.	Subject Code	Subject	Sl. No.	Subject Code	Subject
1	10IP / IM 751	Enterprise Resource Planning	1	10IP/IM 761	Financial Management
2	10IP/IM 752	Concurrent Engineering	2	10IP/IM 762	Project Management
3	10IP/IM 753	Marketing Management	3	10IP/IM 763	Composite Materials
4	10IP/IM 754	Technology Management	4	10IP/IM764	World Class Manufacture
5	10IP 755	Simulation Modeling & Analysis	5	10IP 765	Management Information Systems
			6	10IP766	Machine Tool Design

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VIII SEMESTER

Sl. No	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hours / week		Examination			
				Theory	Pract	Duration (Hrs)	Marks		
							IA	Theory/Pract.	Total
1	10IP/IM 81	Supply Chain Management	IP/IM	04	--	03	25	100	125
2	10IP/IM 82	Facilities Planning and Design	IP/IM	04	--	03	25	100	125
3		Elective IV (Group D)	IP/IM	04	--	03	25	100	125
4		Elective V (Group E)	IP/IM	04	--	03	25	100	125
5	10IP 85	Project Work	IP	--	--	03	100	100	200
6	10IP 86	Seminar	IP	--	03	03	50	-	50
Total				16	03	--	250	500	750

Elective IV (Group D)			Elective V (Group E)		
Sl. No.	Subject Code	Subject	Sl. No.	Subject Code	Subject
1	10IP/IM 831	Organizational Behaviour	1	10IP/IM 841	Artificial Intelligence & Expert Systems
2	10IP/IM 832	Knowledge Management	2	10IP/IM 842	Just in Time Manufacturing
3	10IP/IM 833	Design of Experiments	3	10IP/IM 843	Automation in Manufacture
4	10IP/IM 834	Advanced Operations Research	4	10IP 844	Product Design & Manufacturing*
5	10IP/IM 835	Data Base Management System	5	10IP 845	Engineering System Design*
6	10IP 836	Advanced Joining Processes & NDT*	6	10IP 846	Automobile Engineering *

*Does not match with the scheme placed before AS/EC for approval

**V SEMESTER
MANAGEMENT & ENTREPRENEURSHIP**

Subject Code	: 10AL 51	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 of profession – Management & 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 organization – Types of organization – Departmentation – Committees- Centralization Vs Decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning Only) Nature and importance of staffing–Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, 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, Entrepreneur-an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in

entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

6 Hours

UNIT - 6

SMALL SCALE INDUSTRIES: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI – Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies of Government for SSI, 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.

7 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.
2. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House.
3. **Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).
4. **Management & Enterpreneruship**-N V R Naidu, IK Internatioal, 2008

REFERENCE BOOKS:

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

ENGINEERING ECONOMY

Subject Code	: 10IP /IM 52	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.

6 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.

4 Hours

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

3 Hours

UNIT - 6

DEPRECIATION: Causes of Depreciation, Basic methods of computing depreciation charges

3 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 - 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

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 economics** - RIGGS J.L. - McGraw Hill - 2002.
2. **Engineering economy** - PAUL DEGARMO - Macmillan Pub Co. - 2001.
3. **Engineering Economy** - Naidu, Babu and Rajendra – 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.

WORK STUDY AND ERGONOMICS

Subject Code	: 10IP /IM 53	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

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

7 Hours

UNIT - 4

MICRO AND MEMO MOTION STUDY: Charts to record movements at work place – principles of motion economy, Therbligs and classification of movements, 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

STOP WATCH 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 affecting rate of working, allowances and standard time determination.

PREDETERMINED MOTION TIME STUDY (PMTS)

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. **Motion and Time study** - Marvin E. Mundel – PHI -1st edition.
4. **Work Study and Ergonomics** - S Dalela and Sourabh, – Chand Publishers - 3rd edition.

REFERENCES BOOKS:

1. **Human Factors in Engineering Design** - S Sanders and E J McCormick - Mc Graw Hill - 6th Edition.
2. **Industrial Engineering Hand book** - Maynard.
3. **Engineered work Measurement** – Wledon - ELBS - 1991.

CAD/CAM

Subject Code	: 10IP /IM 54	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: CAD/CAM, Product cycle & CAD/CAM, Design process, Application of Computers for Design, Traditional Production Planning & Control, Computerized Integrated Production Management System, Advantages & Disadvantages of CAD & CAM.

FUNDAMENTALS OF CAD: Comparison of general design process and CAD process, Concept of manufacturing data base, general consideration of Hardware for a typical CAD system. **7 Hours**

UNIT - 2

COMPUTER GRAPHICS SOFTWARE & DATA BASE: Introduction, Software Configuration of a Graphics System, Functions of a Graphics Package, Constructing the Geometry, Transformations, Data Base Structure & Content, Wire-Frame versus Solid Modeling, Introduction to exchange of modeling data-Basic features of IGES, STEP, DXF, DMIS. **7 Hours**

UNIT - 3

INTRODUCTION TO FINITE ELEMENT ANALYSIS: Introduction, Basic Concepts, Discretization, Element types, Nodes & degrees of freedom, Mesh generation, Constraints, Loads, Preprocessing, Application to static analysis. **6 Hours**

UNIT - 4

NC, CNC, DNC TECHNOLOGIES: NC, CNC, DNC, Modes, NC Elements, Advantages and Limitations of NC, CNC. Functions of computers in DNC.

CNC MACHINE TOOLS: CNC tooling, Turning tool geometry, Milling tooling system, Tool presetting, ATC, Work holding, Overview of different CNC machining centers, CNC Turning centers, High speed machine tools.

7 Hours

PART - B

UNIT - 5

CNC PROGRAMMING: Part program fundamentals, Steps involved in development of a part program, Manual part programming, Milling & Turning Center Programming **7 Hours**

UNIT - 6

APT PROGRAMMING: APT Programming in Drilling, Milling & Turning **6 Hours**

UNIT - 7

INTRODUCTION TO ROBOTICS: Introduction, Robot configuration, Robot motions, End effectors, Work cell, Control & Interlock, Robot Sensor, Robot applications. **6 Hours**

UNIT - 8

PROGRAMMING THE ROBOTS : Robot-Programming Languages, Introduction to different languages and writing the programming for palletising operation **6 Hours**

TEXT BOOKS:

1. **CAD/CAM** - Mikell P. Groover and Emory W. Zimmers Jr - Pearson Education Inc - 2003.
2. **CAD/CAM Principles and Applications** - P.N. Rao – TMH, New Delhi - 2002.

REFERENCE BOOKS:

1. **Principles of Interactive Computer Graphics** - Newman and Sproull – Tata McGraw Hill - 1995.
2. **CAD/CAM** - Ibrahim Zeid – Tata McGraw Hill - 1999.
3. **Computer Aided Manufacturing** - P. N. Rao, N. K. Tewari and T. K. Kundra – Tata McGraw Hill - 1999.

DESIGN OF MACHINE ELEMENTS

Subject Code	: 10IP /IM 55	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 loads and factor of safety. Theories of failure: Maximum Normal Stress Theory, Maximum Shear Stress Theory, Distortion energy theory. Failure of Brittle and Ductile materials. Stress concentration. Determination of stress concentration factor. **7 Hours**

UNIT - 2

DESIGN FOR FATIGUE STRENGTH: S – N Diagram, low cycle and High cycle fatigue. Endurance limit. Modifying factors: Load, Size and Surface finish effects. Fatigue stress concentration factor. Fluctuating stresses. Goodman and Soderberg Relationship. Stresses due combined loading, Cumulative fatigue damage. **6 Hours**

UNIT - 3

KEYS, COUPLINGS, COTTER AND KNUCKLE JOINTS: Design of Keys, Design of rigid flange coupling, Bush and Pin type Flexible Coupling, Design of Cotter and Knuckle joints. **6 Hours**

UNIT - 4

DESIGN OF SHAFTS: Design of shafts subjected to torsion, bending moment and combined torsion moment and axial loading. ASME and BIS Codes for design of transmission shafting. Design for strength and rigidity. Shafts under fluctuating loads and combined loads. **7 Hours**

Part B

UNIT - 5

DESIGN OF GEARS: Introduction to Spur, Helical and Bevel Gears. Design of Spur gear, Lewis equation, form factor, stresses in gear tooth, Dynamic load and wear load. **6 Hours**

UNIT - 6

RIVETED JOINTS AND WELDED JOINTS: Types of riveted joints, failures of riveted joints, Boiler joint, Efficiency.

Types of welded joints, Strength of butt and fillet welds, Eccentrically loaded 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. Stresses in Leaf springs. **6 Hours**

UNIT - 8

LUBRICATION AND BEARINGS: Mechanism of lubrication, Viscosity, Bearing Modulus, Coefficient of friction, minimum oil film thickness. Heat generated and Heat dissipated.

Examples of journal bearing and thrust bearing design.

BALL AND ROLLER BEARINGS: Bearing life, Equivalent bearing load, Selection of Deep groove ball bearings. **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 and Distributors, Delhi - 1983.
3. **Design of Machine Elements** - V. B. Bahandari – Tata McGraw Hill, New Delhi - 2000.

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 – Chorotar Publishing house – 2002.

HYDRAULICS AND PNEUMATICS

Subject Code	:	10 IP56	IA Marks	:	25
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO HYDRAULIC SYSTEM: Hydraulic oils – Desirable properties, Viscosity index, General type of fluids, Reservoir system, Filters and strainer. Pascal's Law and its applications, Application of Continuity equation, Structure of a typical Hydraulic circuit and the components of it. (Numerical Treatment). **6 Hours**

UNIT - 2

PUMPS: Pumping theory, Pump Classification, Gear Pumps, Vane Pumps- Simple and Balanced, Piston Pumps, Pump performance, Pump selection (Numerical Treatment). **7 Hours**

UNIT - 3

HYDRAULIC ACTUATORS & 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. (Numerical Treatment). **7 Hours**

UNIT - 4

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- Closed, Open, Tandem, Regenerative and Floating, 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**

PART - B

UNIT - 5

STUDY OF DIFFERENT HYDRAULIC CIRCUITS : 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 Hydraulics Motors, Accumulators and their applications in Auxiliary and Emergency power source. **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, Preparation of compressed air – Driers, Filters, Regulators, Lubricators. **6 Hours**

UNIT - 7

PNEUMATIC ACTUATORS & VALVES: Linear Cylinder – Types, Conventional type of cylinder – working, End position cushioning, Directional control valve-3/2,4/2,&5/2, Memory valve, Shuttle valve, Quick exhaust valve, Twin pressure valve, Direct and indirect actuation of pneumatic cylinder. **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 and Travel dependent controls. **6 Hours**

TEXT BOOKS:

1. **Fluid Power with applications** - Anthony Esposito – Pearson Education - Fifth edition, 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. **Pneumatic Basic Level TP 101** - Peter Croser & Frank Ebel, Festo – Didactic publication - 1999.
2. **Pneumatic Control for Industrial Automation** - Peter Rohner & Gordon Smith – John Wiley Sons publication – 1989.
3. **Power Hydraulics** - Michael J Pinches & John G Ashby – Prentice Hall – 1989.

MECHANICAL AND FLUID POWER LAB

Subject Code	: 10IPL 57	IA Marks	: 25
No. of Lab Hours./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hours.	: 42	Exam Marks	: 50

PART – A

FLUID POWER LAB

1. a) Study of components of Hydraulic circuit.
b) Study of symbols for components in hydraulic circuits.
2. Testing of Pump.
3. Testing of Flow Control Valve.
4. Speed control of Piston in Forward and Return stroke with Meter in Meter out circuit.
5. Study of Regenerative circuit and study of Bleed of circuit.
6. Study of Variation of Flow with pressure and with throttle.
7. Building of Circuits using different kinds of Valves.

PART - B

MECHANICAL ENGINEERING LAB

(At least Four experiments)

1. Determination of viscosity of lubricating oil using Redwoods and Saybolts – Viscometers.
2. Flash and Fire point of given oil
3. Performance Tests on Four stroke Petrol and Diesel Engines, Calculations of IP, BP, thermal efficiencies, SFC, FP and heat balance sheet.
4. Multi cylinder petrol / diesel engine (Morse test).
5. Performance test on Centrifugal or Reciprocating pumps.
6. Study of flow through pipes for fluid transport.

Note: A minimum of 12 exercisers are to be conducted

WORK STUDY AND ERGONOMICS LAB

Subject Code	: 10IPL/IML 58	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A METHOD STUDY

Recording Techniques: Preparing the following charts and diagrams
(Minimum 3 Charts)

1. Outline process chart, Multiple Activity Chart
2. Flow process chart and Flow diagram, String diagram
3. Experiments on the Application of principle of motion economy
Two handed process chart
4. SIMO chart
5. Exercises on conducting method study for assembling simple components and office work.
6. Development of Layout plans using SLP technique
7. Experiments on Line balancing. (demo only)

PART - B WORK MEASUREMENT

1. Rating practice using: walking simulator, pin board assembly, dealing a deck of cards
2. and marble collection activity
3. Determining the standard time for simple operations using stopwatch time study
4. Exercises on estimating standard time using PMTS.
5. Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
6. Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer
7. Effect of Noise, Light, Heat on human efficiency in work environments.

Note: A minimum of 12 exercisers are to be conducted

REFERENCE BOOKS:

1. **ILO Introduction to work study** - 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.

VI SEMESTER MATERIALS MANAGEMENT

Subject Code	: 10IP /IM 61	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: Dynamics of Materials Management - Materials Management at Micro-level, Materials Management at Macro-level, Inventories of Materials, Total Concept-Definition - A Brief History of Development: An Overview.

SYSTEMS APPROACH TO MATERIALS MANAGEMENT: Systems Approach - The Process of Management and the Materials Function, Interfaces, An Overview of the Systems Concept, Benefits of the Integrated Systems Approach.

6 Hours

UNIT - 2

FORECASTING Objectives and the Materials Organization: Systems Design, Integral Control of the Flow of Materials, Forecasting and Planning, Forecasting Methods, Objectives of Materials Management - Organization of Materials Management, Environmental Change, Functional Organization Model for Materials Management.

MATERIALS PLANNING: Making the Materials Plan Work, The Materials Cycle and Flow Control System, Materials Budget.

6 Hours

UNIT - 3

PURCHASING: Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing - Scope, Responsibility and Limitations, Sources of Supply and Supplier Selection, Purchasing Policy and Procedures - Purchase Budgets and Statistics.

PURCHASING IN MATERIALS MANAGEMENT SYSTEM

CONCEPT: Price Determination, Price Forecasting, Price-Cost Analysis, The Learning Curve, Negotiation, Reciprocity, Cost-Plus Contracts, Hedging, Forward Buying, Buying Ethics, Principles and Standards of Purchasing, Make-or-Buy, Information, Documentation and Purchasing Library, Legal Aspects of Purchasing, Law of Agency, Law of Contract, Legal Status of the Buyer, Warranties and Conditions, Right of Inspection, Right of Rejection, Vendor-Vendee Relations, Vendor Development, Vendor Rating.

8 Hours

UNIT- 4

PURCHASING AND PROCUREMENT Activities under Materials Management: Supplier Quality Assurance Programme, Buyer-Supplier Relationship.

INCOMING MATERIAL QUALITY CONTROL: Significance of Inspection, Purchase Inspection, Sampling Inspection, Sampling Technique, Different Types of Population, Different Types of Sampling, Risks of Sampling. SQC in Operation: A Work-site Problem Study. **6 Hours**

PART - B

UNIT - 5

PURCHASING CAPITAL Equipment, Plant and Machinery: Responsibility and Decision, Purchasing v/s Leasing, International Buying, Import Purchasing, and Governmental Purchasing: Industrial Needs, Import Procedure and Documents, Classification of Stores-Categories of Importers-Import Application, Basis of Licensing, Import Purchasing Procedures, Letter of Credit, Income-Tax Clearance, Customs Tariff-Registration of Licenses at Port. Governmental Purchasing: Policy and Procedures, Tenders, Inspection of Articles.

6 Hours

UNIT-6

REGISTRATION of Firms, Procedure for Registration, Terms of Registration, Removal of the Firms from the List, Blacklisting of Firms, Banning of Firms, Suspension of Firms, Purchases of the Stores by the DGS&D - Surplus Disposals by the DGS&D, Pre-disposal Inspection of Surpluses.

Inventory Management and Control Systems: Definition of Inventories, The Need for Inventory Audits Control, Types of Inventories, Inventory Control, Max-Min System, Inventories and Demand Uncertainty, Determining Safety Stock.

7 Hours

UNIT – 7

INVENTORY MODELS: Deterministic Inventory Models with numerical examples, Q-system or Quantity Control System or Re-order Point System-Effect of Quantity Discounts, P-system or Periodic Review or Periodic Count System or Replenishment System, Optional Replenishment System or "S, s" Policy, ABC Inventory Classification (Selective Inventory Control - SIC). The Need for a Systems Approach, Materials Planning System (MPS) / Materials Requirement Planning (MRP), Basic Tool.

7 Hours

UNIT - 8

STORES MANAGEMENT AND OPERATION: Storage System, Stores Location and Layout, Development of Storing, Centralization and Decentralization of Stores, Standardization and Variety Reduction, The Systems, Merits and Demerits of Codification.

MATERIALS MANAGEMENT INFORMATION SYSTEM AND COMPUTER: MIS - Management and MM, Computer System for MIS and MM, In-process Materials and Management Control.

6 Hours

Text Book:

1. **Materials Management** - A.K. Datta - PHI Pvt. Ltd, New Delhi - 2001.
2. **Operations Research** - S.D. Sharma – Kedarnath, Ramnath &Co – 1996.

Reference Book:

1. **Handbook of Materials Management** - P. Gopalakrishnan - PHI Pvt. Ltd, New Delhi - 2002.
2. **Principles of Operations Research Theory and Practice** - Philips, Ravindran and Soleberg – Wiley India Pvt Ltd.

QUALITY ASSURANCE AND RELIABILITY

Subject Code	:	10IP/IM 62	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 of costs and hidden costs. Brief discussion on sporadic and chronic quality problems. Introduction to Seven QC tools. **6 Hours**

UNIT - 2

STATISTICAL PROCESS CONTROL: Introduction to statistical process control – chance and assignable causes for 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. **6 Hours**

UNIT – 3

PROBABILTY DISTRIBUTION – Hyper Geometric, Binomial, Poisson and Normal distribution.

CONTROL CHARTS FOR VARIABLES: Controls Charts for X Bar and Range (R) , Statistical basis of the charts, Development and use of X bar and R charts, Interpretation of charts. Control charts for X bar and Standard Deviation (S), Development and use of X bar 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**

UNIT - 4

CONTROL CHARTS FOR ATTRIBUTES: Control 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. **7 Hours**

PART - B

UNIT - 5

SAMPLING INSPECTION: Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Determination of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk. **7 Hours**

UNIT - 6

USE OF PUBLISHED SAMPLING PLANS: Gauge Repeatability & Reproducibility & Measurement system analysis.

STATISTICAL THEORY OF TOLERANCES: Application of statistical theory of tolerances to design tolerances in random assemblies and application in other areas. **6 Hours**

UNIT - 7

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, parallel and series-parallel device configurations, Redundancy and improvement factors evaluation. **6 Hours**

UNIT - 8

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**

TEXT BOOKS:

1. **Introduction to statistical Quality Control** - D C Montgomery - John Wiley and Sons – 3rd Edition.
2. **Quality Planning & Analysis** - J M Juran, Frank M Gryna - Tata McGraw Hill - 3rd edition,
3. **Statistical Quality Control** - Grant and Leavenworth - McGraw Hill-6th Edition

REFERENCE BOOKS:

1. **The QS9000 Documentation Toolkit** -Janet L Novak and Kathleen C Bosheers - Prentice Hall PTR - 2nd Edition
2. **ISO 9000 a Manual for Total Quality Management** - Suresh Dalela and Saurabh - S Chand and Co. -1st Edition
3. **Total Quality Management** – NVR Naidu, KM Babu and G. Rajendra – New Age International Pvt. Ltd - 2006

OPERATIONS RESEARCH

Subject Code	: 10IP/IM 63	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,

6 Hours

UNIT-2

LINEAR PROGRAMMING Standard form, solution space, Solution – Feasible, basic feasible, Optimal, Infeasible, Multiple, Optimal, Redundancy, Degeneracy. Graphical Method

6 Hours

UNIT -3

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.

7 Hours

UNIT - 4

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.

7 Hours

PART - B

UNIT - 5

ASSIGNMENT PROBLEM: Formulation of the Assignment problem, unbalanced assignment problem, travelling salesman problem

6 Hours

UNIT - 6

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

6 Hours

UNIT - 7

PROJECT MANAGEMENT USING NETWORK ANALYSIS: Network construction, determination of critical path and duration, CPM Structured approach, Calculations of schedules and floats, Network crashing. PERT- Estimation of project duration and variance. **8 Hours**

UNIT -8

GAME THEORY: Formulations of games, Two person zero sum game, games with and without saddle point, graphical solutions ($2 \times n$, $m \times 2$ game), dominance property. Solution of game through LPP.

6 Hours

TEXT BOOKS:

1. **Introduction to Operation Research** - Taha H A - Prentice Hall of India - 6th edition, 1999.
2. **Principles of Operations Research Theory and Practice** - Philips, Ravindran and Soleberg – Wiley India Pvt Ltd.

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.

Subject Code	: 10IP 64	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

DESIGN OF SINGLE POINT TOOL: Tool Signature, Selection of Tool Angles, Design of shank section for single point tool to account for strength and rigidity.

Design of Multi Point Tools - Drill, Reamers **7 Hours**

UNIT - 2

DESIGN of peripheral Milling cutters, Design of Broach. **6 Hours**

UNIT - 3

LOCATION AND CLAMPING: General principles of location, 3-2-1 Principle of Location, Principle of Radial location, General study of locating devices. General principles of clamping, Study of various Clamping devices.

6 Hours

UNIT - 4

DESIGN OF FIXTURES: Difference between a Jig and a Fixture, Design of Milling fixture, Study of other fixtures like Lathe fixture, Inspection fixture. Study of different types of Drill jigs.

7 Hours

PART – B

UNIT - 5

DESIGN OF GAUGES: Types of gauges. Factors to be considered in the design of gauges, Design of Plug gauge, Design of Snap gauge. **6 Hours**

UNIT - 6

DESIGN OF PRESS TOOLS: A General study of Press operations. Elements of a Die, Strip layout, calculation of center of pressure. Design of Blanking Die, Design of Piercing Die, Design of Progressive Die. **7 Hours**

UNIT - 7

DESIGN OF FORMING DIES: Study of Drawing and Bending process, Design of Drawing Die, Design of Bending Die **6 Hours**

UNIT - 8

TOOL LAYOUT AND CAM DESIGN OF SINGLE SPINDLE AUTOMATS: Classification of Automats and their applications. Tool layout and Cam design for automatic screw cutting machine. Introduction to form tools. **7 Hours**

TEXT BOOKS:

1. **Text book of Production Engineering** - P. C. Sharma – Chorotar Publishing house.
2. **Tool Design** - Donaldson and Golding – Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. **Fundamentals of Tool Design** -ASTME

Subject Code	:	10IP 65	IA Marks	:	25
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Scope of CAD/CAM and CIM, Computerized elements of CIM system. **6 Hours**

UNIT - 2

INTRODUCTION TO DIFFERENT COMPUTER HARDWARE: Introduction, Central Processing Unit (CPU), Types OF Memory, Data Representation, The Design Workstation, The Graphics Terminal, Operator Input Devices, Plotters & Other Output Devices, Secondary Storage. **7 Hours**

UNIT - 3

GROUP TECHNOLOGY: Part Families, Part classification and Coding, Production Flow Analysis, Machine Cell Design, Benefits of Group Technology. **6 Hours**

UNIT - 4

FLEXIBLE MANUFACTURING SYSTEMS: What is an FMS? FMS Workstations, Material Handling and Storage System, Computer Control System, Planning the FMS, Analysis of Flexible Manufacturing systems, Applications and Benefits. **7 Hours**

PART - B

UNIT - 5

SEQUENCE CONTROL, PROGRAMMABLE CONTROLLERS AND COMPUTER PROCESS CONTROL: Logic Control and Sequencing, Logic Control Elements, Sequencing Elements, Ladder Logic Diagrams, Programmable Logic Controllers. The Computer Process Interface, Interface Hardware, Computer process Monitoring, Types of Computer Process Control, Direct Digital Control, Supervisory Computer Control, Programming for Computer Process Control. **7 Hours**

UNIT - 6

COMPUTERIZED MANUFACTURING PLANNING SYSTEM: Computer Aided Process Planning, Computer-Integrated Production Planning Systems, Material Requirement Planning, Capacity Planning. **7 Hours**

UNIT - 7

SHOP FLOOR CONTROL AND AUTOMATIC IDENTIFICATION TECHNIQUES: Shop Floor Control, Factory Data Collection Systems, Automatic Identification Systems, Bar Code Technology, Automated Data Collection System. **6 Hours**

UNIT - 8

COMPUTER NETWORKS IN MANUFACTURING AND FUTURE AUTOMATED FACTORY: Hierarchy of Computer in Manufacturing, Local Area Networks, Manufacturing Automation Protocol. Trends in Manufacturing, Future Automated Factory, Human workers in the Future Automated factory.

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 - 2003.
2. **Numerical Control and Computer aided Manufacture** - Pressman and Williams - PHI – 1991.
3. **An Introduction to Automated Process Planning System** - Tiess Cheiu Chang and Richard A Wysk – PHI – 2002.

Subject Code	: 10IPL /IML 67	IA Marks	: 25
No. of Lecture Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

Modelling of simple machine parts using Graphics Package.

Study of Finite Element Analysis Package - 1D, 2D, Structural problems, Evaluation of displacement (Strain) and Stress. Problems involving Beams and Trusses.

PART - B

Modelling and Simulation of Machining process of simple machine parts using CAM packages.

Suggested Software Packages: Solid Works/ Uni Graphics/Catia and MASTER CAM or any other similar packages.

Note: A minimum of 12 exercises are to be conducted.

Subject Code	: 10IPL 68	IA Marks	: 25
No. of Lecture Hours./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hours.	: 42	Exam Marks	: 50

PART - A

1. Machining of T - slot or L- slot on milling machine and Checking
 - a. Parallelism between the surfaces.
 - b. Perpendicularity between surfaces.
2. Exercise on Spur Gear cutting and Measurement of all the parameters of the gear.
3. Machining of Spiral slots on milling machine.
4. Measurement of Cutting forces, Determination of Shear angle, Chip Thickness Ratio and Verification of Merchants Angle Relationship in Turning Operation.
5. Study the variation of Axial force and Torque in Drilling with respect to cutting speed and feed.

PART – B

1. A General study of Acceptance test of commonly used machine tool (Theory).
2. Test for True running of the main spindle of Lathe
3. Test for True running of the main spindle of Drill.
4. Alignment of centers in Vertical plane in Lathe.
5. Testing for true running of Headstock center of a Lathe.
6. Disassembly of
 - a) Lathe Tail Stock ,
 - b) Tool Head of a Shaper and measurement of component dimension.

Note: A minimum of 12 exercises are to be conducted.

Elective I (Group – A)

VALUE ENGINEERING

Subject Code	: 10IP / IM 661	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 solvable 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

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**

TOTAL VALUE ENGINEERING: Concepts, need, methodology and benefits. **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 Analysis and Engineering** – Lawrence D. Miles - McGraw Hill Book Company - 2nd Edn.
2. **Value engineering for Cost Reduction and Product Improvement** – M.S. Vittal - Systems Consultancy Services - Edn 1993.
4. **Value Management, Value Engineering and Cost Reduction** – Edward D Heller - Addison Wesley Publishing Company – 1971.

Reference Books:

1. **Value Analysis for Better Management** – Warren J Ridge - American Management Association - Edn 1969.
2. **Getting More at Less Cost** (The Value Engineering Way) – G.Jagannathan - Tata Mcgraw Hill Pub. Comp. - Edn 1995.
3. **Value Engineering** – Arther E Mudge - McGraw Hill Book Comp. - Edn 1981.

THEORY OF METAL FORMING

Subject Code	: 10IP / IM 662	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

BASICS OF PLASTIC DEFORMATION: Concept of true stress and true strain. Flow stress and strain hardening. State of stress (both biaxial and triaxial). Normal and shear stresses on a inclined plane. Principal stresses and maximum shear stress. Tresca's and Von-Mise's yield criteria and yield surface. **07 Hours**

UNIT – 2

INTRODUCTION TO METAL FORMING: Classification of forming processes. Importance of temperature in metal forming. Hot and cold working. Effect of strain rate. Friction and its role in metal forming. Influence of metallurgical structure and hydrostatic stress in metal forming. Different methods of analysis of metal forming. **06 Hours**

UNIT – 3

FORGING PROCESS: Open-die and close-die forging processes. Different types of forging operations. Brief description of the forging machines, equipments and heating furnaces. Slab analysis of upset forging of rectangular slab under plane strain condition and upset forging of circular disc. Forging load calculation. Common forging defects. **06 Hours**

UNIT – 4

ROLLING OF METALS: Flat rolling and section rolling. Different types of rolling mills. Geometrical considerations in rolling. Role of friction in rolling and neutral point location. Simplified methods for calculating rolling load, torque and power required for rolling. Effect of back and front tension on rolling force. Elastic deformation of rolls, its effect and controlling methods. Residual stresses in rolling and common rolling defects **07 Hours**

PART – B

UNIT – 5

EXTRUSION: Types of extrusion processes. Metal flow pattern in extrusion. Extrusion dies and other equipments used. Extrusion of hollow sections. Slab analysis of extrusion of strips and circular sections and calculation of force and power required for extrusion. Common extrusion defects. **07 Hours**

UNIT – 6

DRAWING OF RODS, WIRES AND TUBES: Drawing equipments and dies. Tandem drawing of wires. Analysis of rod or wire drawing and calculation of draw force and power required. Maximum possible reduction in drawing. Tube drawing using different types of mandrels, residual stresses and defect in drawn products. **06 Hours**

UNIT – 7

SHEET METAL WORKING: Classification of sheet metal working and equipments used, Blanking and Piercing operation – Die design, cutting force required, slitting, trimming and shaving operations

Bending operation – Types of bending. Bend angle, bend radius, bend allowance and force required for bending. Springback effect in bending. Roll bending process. Brief description of spinning and stretch forming processes.

06 Hours

UNIT – 8

SHEET METAL DRAWING: Process, Die design, Number of draws required, Blank size calculation, and drawing force necessary. Drawability and defects in drawn products.

HIGH ENERGY RATE FORMING (HERF): Introduction to the process and brief description of Explosive forming, Electro discharge forming, and Electromagnetic forming. **06 Hours**

TEXT BOOKS:

1. **Mechanical Metallurgy** - Dieter G.E – McGraw Hill publication.
2. **Fundamentals of Metal Forming Processes** – Juneja B.L - New age International
3. **Principle of Industrial Metal Working Processes** – Rowe Edward - CBS Publication

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing** – E.Paul, DeGarmo etal - PHI publication.
2. **Fundamentals of Working of Metals** – Sach G. - Pergamon press.

FINITE ELEMENT METHOD

Subject Code	: 10IP / IM 663	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 use of FEM – Advantages and Disadvantages of FEM Matrix algebra – Terminologies relating to 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 Raleigh-Ritz method 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.

7 Hours

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 numerical, 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 matrices for 1D and 2D element, computation of Eigen value and vector for simple one Dimensional analysis.

6 Hours

UNIT - 8

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** - Chandrapatla and Belegundu – Pearson edn - 2002.

REFERENCE BOOKS:

1. **A First course in Finite Element methods** - Daryl.L.Logon - Thomson Learning - 3rd edition, 2001.
2. **Fundamentals of Finite Element method** - Hutton – Mc Graw Hill - 2004.
3. **Concepts & applications of FEA** - Robert Cook et,al – 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.

Subject Code	: 10IP / IM 664	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,

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 Human Resources** – CB Mamoria – Himalaya Publication House – 2003.

REFERENCES BOOKS:

1. **Personnel / Human resource Management** – Decenzo and Robbins - PHI - 2002
2. **Industrial Relations** – Arun Monappa – TMH - ISBN – 0-07-451710-8.
3. **Human Resources Management** – VSP Rao
1. **Human Resources Management** – Ravi Dharma Rao

Subject Code	: 10IP 665	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ANALYSIS OF CASTING PROCESS: Gating design for simple vertical gating and Bottom gating. Aspiration effect and Sprue design. Cooling and solidification of casting, rate of solidification. Riser design and placement. (Numerical Treatment). **8 Hours**

UNIT - 2

ANALYSIS OF MACHINING PROCESS: Estimation of torque and thrust force in drilling operation. Estimation of cutting force and thrust force and power consumption in milling operation. Estimation of tooth spacing and load estimation in Broaching. (Numerical Treatment). **7 Hours**

UNIT - 3

ANALYSIS OF FINISH MACHINING PROCESS: Components of grinding force. Estimation of uncut thickness, force per single grit and power consumption in grinding. Grinding wheel characteristics, wheel specification and selection, wheel life. (Numerical Treatment). **5 Hours**

UNIT - 4

ECONOMICS OF MACHINING: Optimization of cutting parameter for minimum cost. Optimizing cutting parameters for maximum production. Optimum cutting speed for maximum efficiency. (Numerical Treatment). **6 Hours**

PART - B

UNIT - 5

ANALYSIS OF WELDING PROCESS: Structure and characteristics of arc, Arc efficiency, electrical characteristics of an arc. Requirements for an arc. Welding power source. Volt-ampere characteristics of a welding power source. Process variables in submerged Arc welding, Gas Metal Arc welding (GMAW), Shielded Arc welding (SAW). Economics of welding. (Numerical Treatment). **8 Hours**

UNIT - 6

ANALYSIS OF ROLLING AND FORGING: Assumptions in analysis of rolling. Determination of rolling pressure, roll separating forces, pressure distribution in rolling, torque and power required to drive the rolls, power loss in bearing. (Numerical Treatment).

Assumptions made in open die forging of a flat strip. Determination of maximum force required for forging a strip and a disc between two parallel dies, forging of disc. (Numerical Treatment). **6 Hours**

UNIT - 7

ANALYSIS OF ULTRASONIC MACHINING: Assumptions made in analysis of material removal rate in ultrasonic machining. Calculating material removal rate in USM. Study of process parameters. (Numerical Treatment). **6 Hours**

UNIT - 8

ANALYSIS OF ELECTRO-CHEMICAL MACHINING: Electrochemistry of ECM process, Calculation of material removal rate. Kinematics and dynamics of the process, effect of heat and H₂ bubble generation. Study of factors affecting the surface finish. Tool design ECM. (Numerical Treatment). **6 Hours**

TEXT BOOKS:

1. **Manufacturing Science** - Amitabh Ghosh and Ashok Kumar Mallik – Affiliated East-West Press Private Ltd.
2. **Welding Processes and Technology** - Dr.R S. Parmar – Khanna Publishers.

REFERENCE BOOK:

1. **Principles of Machine tools** - Sen and Bhattacharya – Oxford IBM Publishing - 2000.

TOTAL QUALITY MANAGEMENT

Subject Code	: 10IP/IM 71	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, contributions 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, QFD.

7 Hours

UNIT - 2

EVOLUTION OF QUALITY CONCEPTS AND METHODS: Quality concepts. Development of four fitnesses, 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.(1st Chapter)

REFERENCE BOOK:

1. **The Quality Improvement Hand Book** - Roger C Swanson - Publisher Vanity Books International, New Delhi - 1995.
2. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd – 2008.

Subject Code	: 10IP/IM 72	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.

SYSTEM DESIGN AND CAPACITY:

Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

7 Hours

UNIT - 3

FORECASTING DEMAND:

Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

7 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 SCHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

7 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, Preventive maintenance, continuous improvement, Kaizen.

7 Hours

TEXT BOOKS:

1. **Operations Management** - Monks J.G. - McGraw-Hill International Editions - 1987.
2. **Production and Operations Management** - Pannerselvam. R – PHI - 2nd edition.
3. **An introductory book on lean systems**, TPS, Yasuhiro Monden

REFERENCE BOOKS:

1. **Modern Production/Operations Management** - Buffa - Wiely India Ltd. - 4th edition.
2. **Production and Operations Management** - Chary, S.N - Tata-McGraw Hill. - 3rd edition
3. **Production and Operations Management** – Adam & Ebert, PHI, 5th edition

NON CONVENTIONAL MACHINING PROCESSES

Subject Code	: 10IP73	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: History, Need for non-traditional machining methods, Comparison between Conventional and Non-Conventional Machining Process, Classification.

MECHANICAL PROCESS: Ultrasonic machining (USM) : Introduction, Equipment, tool materials & tool Size, Abrasive slurry, Cutting tool system design : Mechanics of cutting : Theory of Miller & Shaw, Effect of parameter : Effect of amplitude and frequency of vibration, Effect of grain diameter, Effect of applied static load, Effect of slurry, Tool and work material, USM process characteristics , Material removal rate, tool wear, 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 abrasives, 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

ELECTRON BEAM MACHINING (EBM): Introduction-Equipment for production of Electron beam – Theory of electron beam machining – Thermal & Non thermal types, characteristics – applications.

LASER BEAM MACHINING (LBM): Introduction-principle of generation of lasers, Equipment and Machining procedure-Types of Lasers-Process characteristics-advantages and limitations-applications. **6 Hours**

UNIT - 4

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.

Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations. **6 Hours**

PART - B

UNIT - 5

CHEMICAL MACHINING (CHM): Introduction, Elements of the process
Chemical blanking process: - Preparation of work piece. 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. **7 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, electrode material selection, under sizing and length of electrode, Machining time. **7 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 McGraw Hill -2000.

Reference Books:

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

MECHATRONICS

Subject Code	: 10IP 74	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition of Mechatronics, Multi-disciplinary scenario, Evaluation of Mechatronics, Objectives, Advantages & Disadvantages of Mechatronics, An Overview of Mechatronics, Microprocessor Based Controllers, Principle of Working of Automatic Camera, Automatic Washing Machine & Engine Management System. **6 Hours**

UNIT - 2

REVIEW OF SENSORS AND TRANSDUCERS: Definition and Classification of Transducers, Definition & Classification of Sensors, Working Principle and Application of Displacement, Position & Proximity, Velocity and Motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors, Selection of transducers. **6 Hours**

UNIT - 3

DIGITAL PRINCIPLES: Introduction, Digital Number System, Range and Weight of Binary Number System, Octal and Hexadecimal Number Systems, Conversion, BCD Number Systems, Gray Code, Boolean Algebra, Logic States, Logic Functions, More Logic Gates, Universal Gates, Exclusive-OR Gate, Combinational and Sequential Logic Circuits, Flip-Flops, Minimization of Boolean Expression, Karnaugh Map, TTL and CMOS, Memory. **7 Hours**

UNIT - 4

MICROPROCESSOR: Intel 8085, ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration, Intel 8085 Instructions, Op code and Operands, Instruction Word Size, Instruction Cycle, Fetch Operation, Execute Operation, Machine Cycle and State, Instruction and Data Flow, Timing Diagram, Timing Diagram for Op code Fetch Cycle, Memory Read, I/O Read, Memory Write, I/O Write, Instruction and Data Formats, Addressing Modes, Direct Addressing, Register Addressing, Register Indirect Addressing, Immediate Addressing, Implicit Addressing. **7 Hours**

PART - B

UNIT - 5

MICRO CONTROLLER: Introduction to microcontrollers, Intel 8051 Microcontroller Architecture and Pin diagram, Selection and Application of Microcontroller. **6 Hours**

UNIT - 6

PLC: Programmable Logic Controllers, Basic Structure, Input/Output Processing, Programming, Mnemonics, Timers, Internal Relays and Counters, Shift Registers, Master and Jump controls, Data handling, Analogue input/output, Selection of a PLC. **7 Hours**

UNIT - 7

ACTUATORS: Definition, Classification of Actuators, Brief survey of Electromechanical actuators, Drive requirements for cutting movements, Requirements of feed drives, Calculation of drive requirements on feed motor shaft, DC motors & Control of DC motors, AC motors, DC & AC servomotors, Stepper motors- types, Characteristics, advantages, limitations and applications. **7 Hours**

UNIT - 8

SYSTEM MODELS: Mathematical models, Mechanical system building blocks, Electrical system building blocks, Fluid system building blocks, Thermal system building blocks. **6 Hours**

TEXT BOOKS:

1. **Mechatronics** - W. Bolton – Pearson Education Asia - 2nd Edition, 2001.
2. **Fundamentals of Microprocessor and Micro Computer** - B. Ram - Dhanpat Rai and Sons - 4th Revised Edition.

REFERENCE BOOKS:

1. **Mechatronics** Principles, Concepts and Application - Nitaigour and Premchand, Mahilik – Tata McGraw Hill - 2003.
2. **Mechatronics** by HMT - TMH.

SOFTWARE APPLICATIONS LAB

Subject Code	:	10IPL 77	IA Marks	:	25
No. of Lab Hours./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hours.	:	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
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.

Reference Book:

Lab manual prepared by the department/institution.

Suggested Software Packages: Oracle / MS SQL Server as the back-end, and VB6.0 / Developer2000 as the front-end tools, SYSTAT and OR Packages.

Note: A minimum of 12 exercisers are to be conducted

CNC AND ROBOTICS LAB

Subject Code	: 10IPL 78	IA Marks	: 25
No. of Lab Hours./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hours.	: 42	Exam Marks	: 50

PART - A

1. Study of functions assigned to Alphabets and Symbols. G and M codes, grouping of codes, Assigned and Unassigned, Model and Non Model codes.
2. Writing the program for Contour Milling - 4 exercises
3. Writing the program using Canned Cycles, Subroutine Programs for Drilling, Reaming and Thread Cutting - 4 exercises
4. Introductory concept of loop in loop program - 2 exercises.

Note:

1. The programs should be written with reference to one user manual provided by manufacture of control unit.
2. Atleast 10 programs must be simulated.

PART - B

- 1 Writing CNC program for Lathe - 2 exercises.
- 2 Exercises on Robots (only demonstration)
 - a. Study of a General Configuration of a Robot.
 - b. Study of Programming methods
 - c. Study of Overview of Robot languages.

Atleast 4 programs to be discussed with specific applications

Note: A minimum of 12 exercisers are to be conducted

ELECTIVE-II (GROUP B)

ENTERPRISE RESOURCE PLANNING

Subject Code	:	10IP / IM 751	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.

7 Hours

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.

7 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 Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

6 Hours

UNIT - 7

ERP MARKET: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates, Inc. QAD

6 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 - Tata Mc Graw Hill Publishing Company Ltd.- 1999.
2. **Enterprise Resource Planning Concept and Practice** - Vinod Kumar Garg and Venkitakrishnan – Prentice Hall, India - 2nd Edition.

REFERENCE TEXT BOOK:

1. **Manufacturing Planning & Controls** - Thomas Volloman - et, al.

CONCURRENT ENGINEERING

Subject Code	: 10IP/IM 752	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 ORGANIZATIONS: 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

C. E. PROCESS: 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** - Prasad.B - Integrated Product and process organization Vol. 1 & 2, Prentice Hall Englewood, Cliffs, New Jersey -1996.
2. **Concurrent Engineering** - Hartely R John – Shortening lead times, raising quality & Lowering costs, Productivity press, Portland, Oregon -1992.

REFERENCE BOOKS:

1. **Concurrent Engineering** - Carter DE & Baker BS - The product development environment for the 1990's. Addison – Wesley Publishing company, Reading MA -1992.

MARKETING MANAGEMENT

Subject Code	: 10IP/IM 753	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.

7 Hours

UNIT - 2

CONSUMER MARKETS AND BUYING BEHAVIOR: 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

7 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.

7 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.

7 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.

REFERENCE BOOKS:

1. **Fundamentals of Marketing** - Wiliam J Stanton - McGraw Hill – 1994.
2. **Marketing Management Text & Cases** - Rajagopal - Vikas Publishing House - ISBN 81-259-0773-4.
3. **Marketing Management** - Michael R Czinkota - Vikas Publishing House - 2nd Edition ISBN 981-240-366-3.

TECHNOLOGY MANAGEMENT

Subject Code	:	10IP/IM 754	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.

7 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.

7 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.

7 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 Perceptions & Opportunities** - Paul Lowe - Chapman & Hall, London - 1995.

REFERENCE BOOKS:

1. **Strategic Management of Technology** - Frederick Betz - McGraw-Hill Inc - 1993.
2. **Management of Technology & Innovation competing Through Technological Excellence** - Rastogi P.N. - Sage Publications - 1995 .
3. **Mastering the dynamics of innovation** – J Utterback

SIMULATION MODELING & ANALYSIS

Subject Code	: 10IP 755	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 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.

7 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

7 Hours

PART - B

UNIT - 5

RANDOM 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.

6 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.

7 Hours

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

6Hours

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 SOFTWARES

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

7 Hours

TEXT BOOKS:

1. **Discrete Event system Simulation** – Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol - Pearson Education, Asia - III Edition - ISBN - 81- 7808 – 505 - 4.

REFERENCE BOOKS:

1. **Systems Simulation with Digital Computer** – Narsingh Deo - PHI Publication (EEE) - ISBN – 0-87692-028-8.
2. **Simulation Modelling & Analysis** – Averill M Law, W David Kelton - McGraw Hill International Editions – Industrial Engineering series, ISBN – 0-07-100803-9.

ELECTIVE III (GROUP C)

FINANCIAL MANAGEMENT

Subject Code	: 10IP/IM 761	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.

7 Hours

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 SICK UNITS: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness, Revival of a sick unit

7 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 - Vol II

REFERENCE BOOKS:

1. **Financial Management Text & 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	: 10IP/IM 762	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 manager, 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.

6 Hours

PART - B

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

7 Hours

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

7 Hours

UNIT - 7

PERFORMANCE MEASURES IN PROJECT MANAGEMENT:

Performance indicators, Performance improvement for the CM & DM companies for better project management, project management and environment, Software Project Management, Construction Project Management.

6 Hours

UNIT – 8

CASE STUDIES ON PROJECT MANAGEMENT: Over view of project management software, Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.

6 Hours

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. **A Management Guide to PERT and CPM** - WEIST & LeVY - Eastern Economy of PH 2002.
2. **PERT & CPM.**- L.S.Srinnath - Affiliated East West Press Pvt. Ltd. - 2002.
3. **Project Management with PERT and CPM** - Moder Joseph and Philips cerel R.
4. **Project planning analysis selection implementation & review** – Prasanna Chandra -ISBNO-07-462049-5 – 2002.

COMPOSITE MATERIALS

Subject Code	: 10IP/IM 763	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 molding.

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.

7 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.Chawla - Springer Verlag -1998.
2. **Introduction to composite materials** - Hull and Clyne - Cambridge University Press - 2nd Edition, 1990.
3. **Composite Materials** - S.C. Sharma - Narora publishing house - 2000.

REFERENCE BOOKS:

1. **Composite Materials hand book** - Meing Schwaitz - McGraw Hill Book Company - 1984.
2. **Forming Metal hand book** - 9th edition, ASM handbook, V15, 1988, P327-338.
3. **Mechanics of composites** - Autar K kaw - CRC Press - 2002.

WORLD CLASS MANUFACTURING

Subject Code	: 10IP/IM 764	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.

7 Hours

UNIT - 3

PRINCIPLES AND PRACTICES 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 MANAGEMENT SYSTEMS:

ISO 9000-2000, IS 14000, Frame Work for Business Excellence - Malcolm Baldrige Award, Deming's Award

7 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.

Introduction to Theory Of Constraints (TOC)

5 Hours

TEXT BOOKS:

1. **World Class Manufacturing- A Strategic Perspective** - Sahay B S, Saxena K B C, Ashish Kumar - MacMillan India Ltd - ISBN 0333-93-4741. (unit 1 & 2)
2. **Finding and Implementing Best Practices- Business Process Benchmarking** -Champ, Robert C. - Vision Books, New Delhi – 2008.(unit 3 & 4)
3. **Reengineering the corporation - A Manifesto for Business revolution** - Hammer, Michael and James Champy - Nicholas Brealey Publishing , London.- 1993(unit 5 & 6)
4. **Six sigma for Managers-** Greg Brue - TMH - ISBN- 0-07-048639-5 -2002.(unit 7)

REFERENCE BOOKS:

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

MANAGEMENT INFORMATION SYSTEMS

Subject Code	:	10IP 765	IA Marks	:	25
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	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.

6 Hours

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.

7 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.

7 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. **7 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. **7 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** - Laudon & Laudon – PHI - ISBN 81-203-1282-1.1998.

REFERENCE BOOKS:

1. **Management Information systems** - S. Sadogopan. - PHI - 1998Edn. ISBN 81-203-1180-9.
2. **Information systems for modern management** - G.R. Murdick - PHI - 2nd Edition.

MACHINE TOOL DESIGN

Subject Code	:	10IP766	IA Marks	:	25
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Principles of Machine Tool Design: General requirements of machine tool design - design process machine tool layout general requirements of machine tool design – design process machine tool layout.

UNIT -2

Machine Tool Drives and Mechanisms: Working and auxiliary motion, Drives – Electric drives, Hydraulic transmission, Kinematic structure, Regulation of speed and feeds, stepped regulation, standardization of speed and feed, Stepless regulation of speeds and feeds. **7 Hours**

UNIT - 3

Cutting Force Analysis and Power Requirement: Turning, Milling, Drilling, Shaping and Broaching operation with simple problems, and General requirements of machine tools – Centre lathe, Milling machine. **6 Hours**

UNIT - 4

Design of Machine Tool Structures: Functions – Requirements – Design criteria Material used – static and dynamic stiffness – Profile and basic design procedure for machine tool structures. Design of beds, columns, housing, bases, tables, cross-rails, arms saddle, carriages. **7 Hours**

PART - B

UNIT - 5

Design of Guide Ways and Power Screws: Function and types of guide ways – Design and lubrication of slide ways – aerostatic slide ways – antifriction guide ways, combination guide ways – protecting devices, design of power screws **7 Hours**

UNIT - 6

Design of Spindle and Spindle Bearings: Functions – Requirements and materials for spindle compliance and machining accuracy, Design of spindles, antifriction bearing, Hydrodynamic and Hydrostatic bearing, Air lubricated bearing. **7 Hours**

UNIT - 7

Dynamics of Machine Tools: Concept of dynamic cutting process, Physical causes of chatter and vibrations, Types of Chatter, chatter vibration in Lathe, Drilling machine, Grinding machine and Milling machine, Different methods for avoiding machine tool chatter and vibration. **6 Hours**

UNIT - 8

Control Systems in Machine Tools: Functions, requirements and classification, Control system for speed and feeds centralized control, pre selective control, Control system for forming and auxiliary motions – Selective Mechanical control – Ergonomic consideration and compatibility – Automatic control system – Electric Hydraulic and pneumatic systems. **6 Hours**

TEXT BOOKS:

1. **Machine Tool Design** - N. K. Mehta – Tata McGraw Hill - 2001.
2. **Principles of Machine tools** - Sen and Bhattacharya – Oxford IBM Publishing - 2000.

REFERENCE BOOKS:

1. **Machine Tool Design Volume** - N. Acharkan – MIR Publications - II and III - 2000.
2. **Design of Machine Tools** - S. K. Basu and D. K. Pal – 2000.

VIII SEMESTER

SUPPLY CHAIN MANAGEMENT

Subject Code	: 10IP/IM81	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 phase, 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.

7 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 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 of 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.

4 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

SUGGESTED TEXT BOOK:

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

REFERENCE BOOKS:

1. **Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems** - Robert B Handfield, Ernest L Nichols, Jr. - Pearson Education Inc - ISBN: 81-297-0113-8. - 2002.
2. **Modelling the Supply Chain** -Jeremy F Shapiro, Duxbury - Thomson Learning – ISBN 0-534-37363. -2002.
3. **Designing & Managing the Supply Chain** -David Simchi Levi, Philip Kaminsky & Edith Simchi Levi - Mc Graw Hill.
4. **Supply Chain and Logistics Management** – Upendra Kachuru

FACILITIES PLANNING AND DESIGN

Subject Code	:	10IP/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

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 based 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

6 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.

3 Hours

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.

6 Hours

UNIT - 8

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

6 Hours

TEXT BOOKS:

1. **Plant layout and material handling** - James M Apple - John Wiley India Pvt Ltd - 2nd Edition.
2. **Facility Layout and location** - Francies R.L and White J A - Mc Graw Hill - 2nd Edition.

REFERENCE BOOKS:

1. **Facilities Design** -Sunderesh Heragu - PWS Publishing Company-ISBN-0-534-95183.
2. **Plant Layout Design** -James M Moore - Mac Millon Co. -1962 – LCCCN61- 5204
3. **Facility Planning** - Tompkins White - Wiley India Pvt Ltd - 3rd Edition.

Elective IV (Group D)

ORGANIZATIONAL BEHAVIOUR

Subject Code	: 10IP/IM 831	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 Organisation Behaviour and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

4 Hours

THE INDIVIDUAL: Foundation of individual behaviour, Ability

2 Hours

UNIT - 2

LEARNING: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.

6 Hours

UNIT - 3

PERCEPTION: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect.

6 Hours

UNIT - 4

VALUES AND ATTITUDES: Definition – values, Attitudes: Types of values, job satisfaction, job involvement, professional Ethics, Organizational commitment, cognitive dissonance.

6 Hours

PART - B

UNIT - 5

MOTIVATION: Maslow's Hierarchy of Needs, Mc. Gregor's theory X and Y, Herzberg's motivation Hygiene theory, David Mc Clelland three needs theory, Victor Vroom's expectancy theory of motivation.

7 Hours

UNIT - 6

THE GROUP: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making.

CONFLICT MANAGEMENT: Definition of conflict, functional and dysfunctional conflict, stages of conflict process.

7 Hours

UNIT - 7

LEADER SHIP: Definition, Behavioural theories – Blake and Mouton managerial grid, Contingency theories – Hersey - Blanchard's situational theory, Leadership styles – characteristics, Transactional, transformation leaders.

8 Hours

UNIT - 8

THE ORGANIZATION: Mechanistic and Organic structures, Mintzberg's basic elements of organization, Organizational Designs and Employee behaviour, organization development – quality of work life (QWL), Team building.

6 Hours

TEXT BOOKS:

1. **Organizational Behaviour** - Stephen P Robbins -Pearson Education Publications - 9th Edn, ISBN–81–7808–561-5.
2. **Organizational Behaviour** – Schermerhorn - Wiley India Pvt Ltd - 9th Edn.
3. **Management of Organizational Behaviour** - Paul Henry and Kenneth H. Blanchard - Prentice Hall of India - 1996.
4. **Organizational Behaviour** – Fred Luthans - Mc Graw Hill International Edition - 9th Edn., ISBN–0–07– 20412–1

REFERENCE BOOKS:

1. **Organisation Behaviour** – Hellriegel, Srocum and woodman, Thompson Learning - Prentice Hall India - 9th Edition, 2001.
2. **Organizational Behaviour** – VSP Rao and others - Konark Publishers - 2002.

KNOWLEDGE MANAGEMENT

Subject Code	: 10IP/IM 832	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 Datenverarbeitung, 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.

8 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

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

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 BOOK:

1. **Knowledge Management** - Sudhir Warier - Vikas Publishing House - ISBN: 81-259-1363-7.

REFERENCE BOOK:

1. **Hand book on Knowledge Management** - C W Holsapple, Springer - 2003 Porter M.
2. **Management Toolkit: Practical Techniques for Building a Knowledge Management System** - Prentice Hall – 1999.
3. **An investigation of Knowledge Management characteristics** - Joshi K - exington, KY – 1998.

DESIGN OF EXPERIMENTS

Subject Code	:	10IP/IM 833	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 of 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

TEXTBOOKS:

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	:	10IP/IM 834	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 method, Revised simplex algorithm and its applications.

6 Hours

UNIT - 2

ADVANCED LINEAR PROGRAMMING: Sensitivity analysis, Integer Programming –graphical technique and Gomory’s technique.

7 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 - solution using Wolfes algorithm

6 Hours

PART - B

UNIT - 5

DYNAMIC PROGRAMMING: Characteristics and DP model, Computational procedure -Simple problems only

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, matrix and their applications.

7 Hours

TEXT BOOKS:

1. **Introduction to Operation Research** -Taha H A - Prentice Hall of India - 6th edition, 1999.
2. **Principles of Operations Research theory and Practice** -Philips, Ravindram and Soleberg– Theory and Practice - Wiley India Pvt Ltd.

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.

DATA BASE MANAGEMENT SYSTEM

Subject Code	: 10IP/IM 835	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 ORGANIZATION: 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 indices 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 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 cat log for RDBMS, 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 - Addison Wesley Publishing Company - 6th Edition.
2. **Database Management System** - Raghu Ramakrishnan and Johannes Gehrke - TATA McGraw Hill - 3rd Edition - ISBN 0-07-1231511

REFERENCE BOOKS:

1. **Database Management Design** - Gary W. Hansen and James V. Hanesn - PHI Pvt. Ltd. - 2nd Edition.

ADVANCED JOINING PROCESSES & NDT

Subject Code	: 10IP 836	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT –I

METAL SURFACING AND SPRAYING: Introduction, Types of wear, types of surfacing, surfacing methods, selection of surfacing process, selection of a surfacing material, surfacing procedure, applications. Introduction to metal spraying, process steps, metallizing materials and their selection. Coating characteristics and evaluation, Applications.

7 Hours

UNIT -II

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.

6 Hours

UNIT –III

UNDERWATER WELDING PROCESSES: Introduction, problems encountered in underwater welding, types of underwater welding, characteristics of a good underwater welding process, methods of underwater welding, Applications.

6 Hours

UNIT -IV

WELDING OF PLASTICS AND COMPOSITES: Principle of welding plastics, common weldable plastics, welding joint design, surface preparation, plastic welding processes, principle of operation, equipment required, Advantages, Applications.

Introduction to Composites, methods preferred welding composites. Induction welding, ultrasonic welding, GTAW, Magnetically Impelled Arc Butt Welding (MIAB)

7 Hours

PART – B

UNIT -V

INTRODUCTION TO ND TESTING: Selection of ND methods, visual inspection, leaks testing Liquid penetration inspection, its advantages and limitations. Magnetic Particle Inspection: Methods of generating magnetic fields – types of magnetic particles and suspension liquids – steps in inspection – application and limitations. Eddy Current Inspection: Principles, operation variables, procedure, inspection coils, and detectable discounts by the method.

7 Hours

UNIT -VII

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, couplets, search units, contact types and immersion types. **6 Hours**

UNIT -VIII

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 -VIII

INDUSTRIAL COMPUTED TOMOGRAPHY: Basic principles, capabilities, and comparison with other NDE methods – application of ICT. Thermal inspection principles, equipment inspection methods applications. **6 Hours**

TEXT BOOKS

1. **Welding processes and Technology** - Dr. R. S. Parmar., – Khanna Publications, 2nd Edition.
2. **A Text book of welding Technology** - O.P. Khanna.,– Dhanapat Rai and Sons
3. **Non-destructive testing-** McGonnagle J.J.,– garden and reach, Newyork (Latest edition)

REFERENCE BOOKS

1. **Non-destructive evaluation and quality control** - Vol.17 of Metals Handbook, 9th edition – Asia internal 1989.
2. **The testing inspection of Engg. Materials** - Davis H.E., Troxell G.E., Wiskovil C.T., McGraw Hill (Latest Edition).
3. **ASM Handbook** – Welding, brazing and soldering, Vol. 6, 2005

Elective V (Group E)

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Subject Code	: 10IP/IM841	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 Search, 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 ACQUISITION: 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: Perceptrons, Checker Playing examples, Learning, Automata, Genetic 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 - Ph - Vol II application, 1985.
3. **A guide to expert systems** – waterman, D.A., Addison – wesley inc. - 1986.
4. **Building expert systems** – Hayes, Roth, Waterman, D.A (ed) – AW - 1983.
5. **Designing expert systems** – weis, S.M. and Kulliknowske - London Champion Hull - 1984.

JUST IN TIME MANUFACTURING

Subject Code	: 10IP/IM 842	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 IMPLIMENTATION 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 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.

AUTOMATION IN MANUFACTURE

Subject Code	: 10IP/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

INTRODUCTION: Definition of Automation, Reasons for Automation, Arguments for and against Automation, Manufacturing industries, Types of Productions, Functions in Manufacturing, Organization & Information processing in Manufacturing. **6 Hours**

UNIT- 2

PRODUCTION CONCEPTS & MATHEMATICAL MODELS: Manufacturing Load Time(MLT), Components of operation time, Capacity, Utilization, Availability, Work in Process(WIP), Automation Strategies. (Including numericals) **7 Hours**

UNIT- 3

PRODUCTION COST ANALYSIS METHODS OF EVALUATING INVESTMENT ALTERNATIVES: Costs in Manufacturing, Break-even Analysis, Unit Cost of Production, Cost of Manufacturing Lead Time & Work-in-process, Other Difficult-to-quantify Factors. **7 Hours**

UNIT- 4

DETROIT-TYPE OF AUTOMATION: Automated Flow Lines, Methods of Work part Transport, Transfer Mechanism, Buffer Storage, Control Functions, Automation for Machining Operations, Design & Fabrication Considerations. **6 Hours**

PART - B

UNIT- 5

ANALYSIS OF AUTOMATED FLOW LINES: General Terminology & Analysis, Analysis of Transfer Lines without storage, Partial Automation, Automated Flow Lines with storage buffers, Computer simulation of Automated Flow Lines. (Including Numericals). **7 Hours**

UNIT - 6

ANALYSIS OF ASSEMBLY SYSTEMS & LINE BALANCING: The assembly process, Assembly Systems, Manual Assembly Lines, Line balancing problem, Methods of line balancing, Computerized Line Balancing Methods, Other ways to improve line balancing, Flexible Manual Assembly Lines, Design for automated assembly, Types of automated assembly

systems, Parts feeding devices, Analysis of multi station assembly machines, Analysis of single station assembly machine. (Including Numericals).

7Hours

UNIT- 7

AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEMS:

The Materials Handling Function, Types of material handling equipments, Analysis for Material Handling Systems, Design of systems, Conveyor systems, Automated guided vehicle systems, Storage system performance, Automated storage & retrieval system, Carousal storage system, Work in process storage, Interfacing handling & storage with manufacturing.

6 Hours

UNIT- 8

AUTOMATED INSPECTION AND TESTING: Statistical quality control, Automated inspection principles & methods, Sensor technologies for automated inspection, Co-ordinate measuring machines, other contact inspection methods, Machine vision, Optical inspection methods, Non-Contact inspection methods.

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 - 2003.
2. **Numerical Control and Computer aided Manufacture** - Pressman and Williams - PHI – 1991.

PRODUCT DESIGN & MANUFACTURING

Subject Code	: 10IP 844	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Introduction To product Design: Asimow's Model : Definition of product Design, Design by Evaluation, 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 Phase), Primary Design phase and flowcharting , role of Allowance, Process Capability, and Tolerance in Detailed Design and Assembly.

6 Hours

UNIT – 2

Product Design Practice And Industry: Introduction, 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 Consideration, 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 Consideration In Product Design: Principal stress Trajectories (Force – Flow Lines), Balanced Design, Criteria and Objective of design, Material Toughness: Resilience, Designing for Uniform Strength, Tension vis-à-vis Compression.

4 Hours

Designing With Plastic, Rubber, Ceramics and Wood: Approach to Design with Plastic, Plastic Bush Bearings, Gears in plastic, Fasteners in plastic, Rubber parts, Design Recommendation for Rubber parts, Distortion in Rubber, Dimensional Effects Tolerances, Ceramics and Glass parts, production Design Factors for Ceramics parts, Special Considerations for Design of Glass parts, Dimensional Factors and Tolerances, Wood.

4 Hours

UNIT – 4

Design of production – Metal Parts: Producibility Requirements in the Design of Machine Components, Forging Design, Pressed Components Design, Casting 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, Design for Powder Metallurgical Parts, Expended Metal and Wire Forms. **6 Hours**

PART - B

UNIT –5

Optimization In Design: Introduction, Siddal's Classification of Design Approaches, Optimization by Differential Calculus, Lagrange Multiplies, 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 a 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. **5 Hours**

Modern Approaches To Product Design: Concurrent Design, Quality Function Deployment (QFD). **2 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, Creative, Steps to problem – solving and value Analysis, value Analysis Test, value Engineering Idea 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., Epingner Tata. - Mc Graw Hill - 3rd Edition, 2003

REFERENCES BOOKS:

1. **Product Design** - Kevin otto and Kristini - wood Pearson Education - 2004.
2. **New product Development** - Tim Jones, Butterworth Heinman, Oxford - UIC -1997.
3. **New product Development: Design & Analysis** - Roland Engene Kinetovicz - John Wiley and Sons Inc., N.Y. – 1990.
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.

ENGINEERING SYSTEM DESIGN

Subject Code	:	10IP 845	IA Marks	:	25
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	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 BOOK:

1. **An introduction to engineering Design Methods** - Vijay Gupta and P.N. Murthy - Tata Mc Graw Hill Publishing company Limited.

REFERENCE BOOKS:

1. **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.
2. **How to be better at Creativity? The industrial Society** - Geoffrey Petty.

AUTOMOBILE ENGINEERING

Subject Code	: 10IP 846	IA Marks	: 25
No. of Lecture Hours./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours.	: 52	Exam Marks	: 100

PART - A

UNIT-1

INTRODUCTION TO AUTOMOBILE SYSTEMS: Spark Ignition (SI) and Compression Ignition (CI) engines, Cylinder arrangements, and their relative merits. Cylinder liners, Piston, Connecting rod, Crank shaft, Valves and Valve actuating mechanisms, Valve and port timing diagrams. Types of combustion chambers. Methods of swirl generation, choice of materials for various engine components. Cooling requirements, methods of cooling, thermostat valves. Different lubricating systems. **8 Hours**

UNIT-2

FUELS, FUEL SUPPLY SYSTEMS FOR SI AND CI ENGINES: Conventional fuels, alternative fuels, Normal and abnormal combustion, Cetane and Octane numbers. Fuel mixture requirements for SI engines, types of carburetors, CD and CC carburetors, multi point and single point fuel injection systems, fuel transfer pumps, fuel filters, fuel injection pumps and injectors. **6 Hours**

UNIT-3

IGNITION SYSTEMS: Battery Ignition system, Magneto Ignition system, Transistor assisted contacts, Electronic ignition. Automatic Ignition advance for load and speed. **6 Hours**

UNIT -4

SUPER CHARGERS AND TURBO CHARGERS: Naturally aspired engines, Forced Induction, Types of Superchargers, Turbochargers construction and operation, Intercooler, Turbocharger lag. **6 Hours**

PART - B

UNIT -5

POWER TRANSMISSION: TYPES OF CLUTCHES: Single plate, Multi plate and Centrifugal clutches. Fluid Flywheel. Numerical calculations for torque transmission by clutches. Gear Box: Necessity for gear ratios in transmission, Synchromesh gear boxes, Three, Four and Five Speed gear boxes. Overdrive, Torque convertors. Epicyclic gear boxes, Principle of automatic transmission. Calculations of road resistance and tractive effort, calculation of gear ratios. **8 Hours**

UNIT-6

DRIVE TO WHEELS: Propeller shaft & Universal joints, Hotchkiss and Torque tube drives. Differential, rear axle, different arrangements of fixing the wheel to rear axle, Steering geometry, & steering gears, centre point steering, Wheel attitudes, Camber, Caster, King pin Inclination, Toe-in and Toe-out. Over steer, Under steer and Neutral Steer.

6 Hours

UNIT-7

SUSPENSION, BRAKES AND TYRES: Suspension requirements, Torsion bar, Leaf spring, Coil spring, Independent suspension for front and rear wheels. Air suspension system.

BRAKES: Different types of braking systems:

Mechanical, air-brakes, vacuum and hydraulic braking systems. Construction and working of master and wheel cylinders. Disc brakes and drum brakes. Anti-lock Braking system.

Tyres: Types of tyres causes and types of tyre wears.

6 Hours

UNIT -8

ELECTRICAL SYSTEMS AND AUTOMOTIVE EMISSION CONTROL SYSTEMS: Electrical system: Generator, voltage regulator, cut-out starter. Automotive emission controls, controlling crankcase emissions, evaporative emissions. Cleaning the exhaust gas. Exhaust gas recirculation. Air-injection system, Air-aspirator system, Catalytic converters. Emission Standards: Euro-I, II, III and IV Norms.

6 Hours

TEXT BOOKS:

1. **Automotive Mechanics** - S. Srinivasan - Tata McGraw Hill - 2003.
2. **Automobile Engineering** - Kirpal Singh - Standard Publishers and Distributors - Vol I and II, 2002.

REFERENCE BOOKS:

1. **Automotive Engineering** - R. B. Gupta - Satya Prakashan - 4th Edition, 1984.
2. **Automobile Mechanics: Principles and Practices** - Joseph Heiter - D Van Nostrand Company Inc.
3. **Automobile Mechanics** - Crouse - Tata McGraw Hill - 10th Edition, 2007.
4. **Problems in Automobile Mechanics** - N.K. Giri - Khanna Publishers - 4th Edition, 1988.
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