WEST BENGAL UNIVERSITY OF TECHNOLOGY
BF- 142, Sector- I, Salt Lake City, KOLKATA- 700 064

MASTER OF TECHNOLOGY IN PRODUCTION TECHNOLOGY & MANAGEMENT

Course Structure

Theory : **SEMESTER - I**

Sl. No.	CODE	Paper	Contacts periods Per weeks			Totals	Credits
			L	T	p		
1.	MM(ME) -101	Advanced engineering Mathematics	3	1	0	4	4
2.	PTM-101	Production Management	4	0	0	4	4
3.	PTM-102	Production planning & Control	4	0	0	4	4
4.	PTM-103	Theory of Machining	4	0	0	4	4
5.	PTM-104 a/b/c	Elective –I a. Operations Research b. Management Information system c. Production Planning & Material Management	4	0	0	4	4
		Total of Theory				20	20

Practical :

Sl. No.	Code	Paper	Contacts period per week			Total	Credits
1.	PTM-191	Computer Aided design Lab.	0	0	4	4	2
2.	PTM-192	Computer Aided Manufacturing Lab.	0	0	4	4	2
3.	PTM-181	Seminar- I	0	2	0	2	1
		Total of Practical				10	5
Total :						30	25

SEMESTER-II

Theory :

Sl. No.	Code	Paper	Contacts periods per weeks			Total	Credits
			L	T	P		
1.	PTM-201	Automation in Manufacturing system & Process	4	0	0	4	4
2.	PTM-202	Non Traditional machining Processes	4		0		4
3.	PTM-203	Quality assessment & Control	4		0		4
4.	PTM-204 a/b/c	Elective-II a.. Robot Application & Design b. Computer Aided Design & Manufacturing c. Industrial Tribology	4	0	0		4
5.	PTM-205 a/b/c	Elective – III a. Energy Management &Audit b. Supply Chain Management	4	0	0		4
		Total of Theory				20	20

Practical :

Sl. No.	Code	Paper	Contacts periods per week			Total	Credits
1.	PTM-281	Seminar – II	0	2	0	2	1
2.	PTM-291	Manufacturing System& Process Lab.	0	0	4	4	2
						6	3
Total :						26	23

SEMESTER-III

Sessional :

Sl. No.	Code	Paper	Contacts periods per week			Total	Credits
1.	PTM-381	Pre-Submission Defense of dissertation	0	0	0	0	4
2.	PTM-382	Dissertation (Progress)	0	0	0	0	18
Total :							22

SEMESTER - IV

Sessional :

Sl.no.	Code	Paper	Contacts periods per week			Total	Credits
1	PTM-481	Dissertation (Completion)	0	**0**	0	0	18
2.	PTM-482	Post submission Defense of Dissertation	0	0	0	0	6
	PTM-483	Comprehensive Exam (Viva-Voce)	0	0	0	0	4
Total :							28

SEMESTER – II

WEST BENGAL UNIVERSITY OF TECHNOLOGY
BF- 142, Sector- I, Salt Lake City, KOLKATA- 700 064

DETAILED SYLLABI OF M. TECH. IN PRODUCTION TECHNOLOGY & MANAGEMENT

Offered By

DEPARTMENT OF MECHANICAL ENGINEERING
JALPAIGURI GOVERNMENT ENGINEERING COLLEGE, JALAPIGURI-735102

SEMESTER - I

THEORY SUBJECTS

MM (ME) - 101 : Advanced Engineering Mathematics

Structure	:	3-1-0	Internal assessment - 30
Credit	:	4	Examinations ……..70
			Total marks ……..100

Statistics : Elements of statistics frequency distribution, concept of menu median and different types of distribution,standard deviation and variance, curve fitting by least square method, correlation and regression, Testing of hypothesis, Basic types of factorial design and analysis of variance……13

Ordinary Differential Equation & Partial Differential Equation. …….4

Matrix operation : Matrix operation, Eigen Value and Binge vector by Iterative methods, Diagonalisation of a square matrix……..08

Imp lace Transform , Fourier Integral and their applications ……06

Numerical methods, Interpolation by polynomials Error analysis solution of system of linear equation by gauss- Seidel iterative methods, Newton rap son methods , Numerical Integration by Gauss- quadrature solution of ordinary differential equation by Rayleigh Ritz method ……12.

References:

1. "Introductory Methods of Numerical Analysis" - S. S. Sastry, PHI
2. "An Outline of Statistical Theory" Volume I, II, -A. M. Goon, M. K. Gupta, B.Dasgupta, The World Press Private Ltd.
3. "The Design of Experiments to find Optimal Conditions" - Yu. P. Adler, E. V.Markova, Ylu V. Granovsky, MIR, 1975, Moscow
4. “Experimental Designs” – Cochran, W.C. and Cox, G.M., John Wiley & Sons, Inc., New York.
5. Linear Algebra – Hadly . Oxford University.
6. Erwin Kreyszig Advanced Engineering Mathematics – John Wiley & Sons Inc.
7. Sinolcy Groysmail and Willionk. Derrick Advanced Engineering Mathematics, Harper & Publishers.
8. Montogomery.

PTM 101 : Production Management

Structure : 4-0-0
Credit : 4

Introduction to production / operations management for competitiveness of corporate, Product life cycle, types of productive systems, process life cycles and technology, focus of an organization.

Forecasting, inventory planning and control, MRP, operations scheduling, statistical quality control.

Product and process design and technological choice, capital cost and criteria for investment, capacity planning, MRP-II, location theory and distribution, work measurement, facility layout and assembly line balancing, multiple criteria decision making methods.

Generic enterprise strategies, role of productivity improvement, components of operations strategy and its implementation,

Operations systems of the future; Computer integrated factory of the future, customer-centric system.

References:

1. Industrial Sociology – E.V. Schneider, McGraw-Hill, 1982.

2. Industrial Sociology-D.C. Miller & W.H.Form Herper & row , 1980.

3. The Sociology of Industry – S.R. Parlar, R.K. Brown & Others, George Allen & Unwin,1970.

4. The Affluent Worker in the class structure – J.H. Goldtherpe,etc. All Camgridge University Press, 1989.

PTM102 : Production Planning and Control

Structure : 3-0-0
Credit : 3

Organisation, organisational structure, types of organisation structure, multi-plant organisation.

Production, Types of Production System and its element, Generalized model Production System.

Products and Services, Design & Development.

Forecasting: Importance the marketing interface, the materials interface, Basic Techniques.

System Economics: Tactics & Strategies, Break-Even-Analysis, Life Cycle analysis and capacity planning.

The plant or facilities - Location and design of the plant or facilities, Layout of the facilities, Equipment selection, Maintenance of the facilities and equipment.

Material and Inventory Management

Demand analysis, Resource Planning, Aggregate Production Planning, Line Balancing.

Materials requirement planning, Sequencing and Scheduling .

Human Factors, Manpower planning, Placement, Training, Motivation, Safety.

Production Monitoring and Control, Performance Criteria and evaluation, Case Studies and Example.

References:

1. "Production and Operations Management" - E. S. Buffa, New Age International (P) Ltd., New Delhi.
2. "Production Systems: Planning, analysis and Control" - J. L. Riggs, John Wiley & Sons, New York.
3. "Production and Operations Management" - S. N. Chary, Tata McGraw-Hill Publishing Co. Ltd., New Delhi

PTM 103 : Theory of Machining .

Structure : 4-0-0
Credit : 4

Machining definition and objectives. Geometry of cutting tools; turning, milling and drilling - in different reference systems like machine reference systems, tool reference system and work reference systems. Sharpening and re-sharpening of cutting tools.

Mechanism of chip formation by single point tools, drills and milling cutters. Types of chips and their characteristics. Effective rake.

Mechanics of machining, theoretical estimation and experimental determination of cutting forces and experimental determination of cutting forces & power consumption. Dynamometers; types, design, construction and use.

Thermodynamics of machining, sources of heat generation, cutting temperature modeling, measurement of cutting temperature. Cutting fluids; purpose, essential characteristics, selection and methods of application.

Cutting tools; methods of failure, mechanics of tool wear, essential properties, assessment of tool life and cutting tool materials.

Economics of machining; principal objectives, main parameters and their role on cutting forces, cutting temperature, tool life and surface quality, selection of optimum combination of parameters.

Advanced machining techniques- eryomachining & high speed machining

Causes of vibration and chatter in machining, and their remedy.

Mechanics of grinding, characteristics, specification and selection of grinding wheels. Process and wheel parameters in grinding. Grinding forces, grinding fluid applications, grinding ratios and surface integrity. Advanced techniques of grinding and modern grinding wheels.

References:

1. "Metal Cutting : Theory and Practice" - A. Bhattacharyya , Central Book Publishers, Kolkata
2. "Metal Cutting Principles" - M. C. Shaw, Oxford University Press CBS
3. "Fundamentals of Metal Machining & Machine Tools" - G. Boothroyd, McGraw Hill
4. "Introduction to Machining Science" - G. K. Lal ,New Age International Pub., New Delhi
5. "Metal Cutting Theory and Cutting Tool Design" - V. Arshinov and G. Alekseev Mir Publishers, Moscow
6. "Manufacturing Science" - A. Ghosh and A. K. Mallik, Affiliated East-West Press Pvt. Ltd., New Delhi
7. "Metal Cutting" - E. M. Trent and P. K. Wright, Butterworth Heinemam Publication
8. "Metal Cutting Mechanics" - N. N. Zorev, Pergamon Press.
9. "Grindings Technology: Theory and Application of Machining with abrasives" - S.Malkin, Ellis Harwood Publication, U. K., 1990
10. "Micromachines" - I. Fujimasa, Oxford Univ. Press.

PTM 104(a) : Operations Research

Structure : 4-0-0
Credit : 4

Introduction to operations research (OR); History of OR; Principles of modeling, Impact of OR; Implementation of OR projects; Different OR problems.
Linear Programming (LP); Introduction, LP model, problem formulation, examples and case studies, limitations of LP, geometrical interpretation, essence of simplex method, algebra of simplex method, simplex procedure, degeneracy and other complications, dual simplex method, economic interpretation of duality, sensitivity analysis, computer implementation.

Simplex explanation of solution methods of Transportation problem and Assignment problem.

Project scheduling: Critical Path Method (CPM), Network construction and determination of critical path, Crashing, Resource smoothing, Resource leveling, PERT .

Non Linear Programming: Graphical illustrations; Integer Linear Programming applications, Graphical solution, branch and bound solution; Dynamic programming.

Inventory Models: EOQ model, Sensitivity analysis in EOQ model, economic lot size model, EOQ with planned shortage, quantity discounts for EOQ model, probabilistic models.

Waiting Line Models; Structure single channel waiting line model, Multiple channel waiting line models, economic analysis of waiting lines.
Forecasting Techniques.

References:

1. "Introduction to Operations Research" - Frederick S. Hiller, Gerald J. Lieberman, McGraw Inc.
2. "Operations Research, Principles and Practice"- Avindran, Phillips and Solberg, John Willey & Sons.
3. "Fundamentals of Operations Research"- R.L. Ackoff, M. W. Sasieni, West Publishing Co.
4. "An Introduction to Management Science" - Anderson, Sweeney, Williams, West Publishing Co.
5. "Operations Research: An Introduction"- H. A. Taha, PHI
6. "Operations Research : Theory and applications" - J. K . Sharma, MacMillan.

PTM 104(b) : Management Information System

Structure : 4-0-0
Credit : 4

An Overview of Management Information Systems, Structure of a Management Information System, Need of MIS

Hardware, Software and Communication Technology for Information Systems. Storage and Retrieval of Data, Transaction Processing, Office Automation and Information Processing.

Data processing Systems, The Decision Making Process, Concepts of Information, Human as Information Processors, System concepts, Concepts of Planning and Control, Real Time Systems, Organizational Structure and Management Concepts. Case Studies.

Supports System for Planning Control and Decision Making, Support Systems for Management of Knowledge Work.

Data Communication hardware, Computer Networks, Developing a Long Range Information system Plan, Strategies for the Determination of Information Requirements, Database Requirements, User Interface Requirements.

Data sources and Data Management, Hierarchy of data organisation, Design & development of Application Systems, Quality assurance and Evaluation of Information Systems, Organization and Management of the Information Resources function, Future Developments and Their Organizational and Social Implications. Elements of software Engineering-models design issue.

References:

1. "Management Information System : Conceptual Foundations, Structure and Development" -Gordon B. Dads, Margrethe H. Olson, McGraw-Hill Book Company.
2. "Management Information Systems"- Larry Long, Prentice .Hall Erewood Cliffs, New Jersey
3. "Principles of MIS" - G.M. Scott, McGraw-Hill Publishing Company.
4. Th. & Prob. On Quantitative Techniques, Management information system & Data processing – S.K. Chakaraborty, New Central Book Agency.
5. Software Project Management- B. Hughes & M.Cotterell, 2nd ed.

PRODUCTION PLANNING & MATERIALS MANAGEMENT

PTM-104(c)

Production Planning & Control; Industrial: Job-shop planning.
Demand Forecasting- Methods & Uses
JIT Manufacturing-Kanban System
Synchronous Manufacturing & Theory of Constraints
Operations Strategies, Hierachical Planning System-Aggregate Planning & Manufacturing Resource Planning.

Materials Management Concepts & Objectives for materials function, administrative practices, purchasing system purchasing cycle, Make or Buy decisions, Vendor Development & Evaluation, Inventory Planning Control & Management. Selective Inventory Control. EOQ Models & variants safety stock stocking policy & Procedure Manuals.

Demand Assessment, Materials Requirement Planning.
Material Handling, Physical Distribution & logistics Standardizations
Computer application in Material Management & MIS.

References:

1. S. Nahmias, (1997) Production & Operation Analysis, R. lrwin.
2. D.D.Bedworth & J.E. Bailey (19839) Integrated Production Control System Mnagement, Analysis & Design , John Wiley.
3. M.penido & X Chao (1999) Operations Scheduling Mc Graw Hill.
4. R.B. Chase, N.J. Aqulano & F.R. Jacobs, Production & Operations management Manufacturing & Services 2nd Ed, TMH
5. John E biegel – Production Control a Quantitative Approval , PHI.
6. E.G. Coffman (1976) Computer & Jobshop Scheduling Theory, wiley.
7. Hanke, Wichem & ReitschBusiness, Forecasting, 7th Ed, PHI.
8. Bloomberg, Lemay & Hanna, Logistics, Phi.
9. R.B.Ballot (1980) Materials Management, Taraporewala, Bombay.
10. P.Gopalkrishnan (1994) , Handbook of Materials Management , PHI.
11. . P.Gopalkrishnan 7 M.S. Sandilya (1981) , Inventory Management, PHI.
12. M.S.SHAH(1988) , An Integrated Concept of Materials Mnagement , TMH.
13. J.Buchan, E. Koenigsberg, Scientific Inventory Mnaegment , PHI.

COMPUTER AIDED DESIGN LABORATORY

PEM 191

Structure : 0-0-4
Credit : 4

Experiments & Assign ments Would be based on the theory subject, computer aided design & Analysis, such as;
. Solving simple structure problems through computer programmers.

. Designing through AUTO CAD , Mechanical Desktop, IDEAS, CATIA,PRO-engineers like softwares.

. Stress Analysis using softwares like ANSYS, etc.

COMPUTER AIDED MANUFACTURING LAB.

PTM - 192

Structure : 0-0-4

Credit : 2

Experiments & assignments would be based on the theory subject, Computer Aided Manufacturing Lab., such as :

. Solving simple structure problems through computer programs.

PTM 181 : SEMINAR

Structure : 0-0-4
Credit : 2

It would be based on literature review on some emerging areas related to this course. Seminar presentation would be made by an individual student & a term paper would have to be submitted by each student separately

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DEPARTMENT OF MECHANICAL ENGINEERING
JALAPIGURI GOVERNMENT ENGINEERING COLLEGE, JALPAIGURI-735102

SEMESTER - II

THEORY SUBJECTS

PTM 201 : Automation in Manufacturing Systems and Processes

Structure : 4-0-0
Credit : 4

Review of basic principles of automation, type and degree of automation, hard automation, flexible automation, stand alone automatic machine tools, transfer machines.

Introduction to computer aided manufacturing (CAM) systems, basic building blocks of computer integrated manufacturing (CIM).

Numerical Control Machines and Systems- CNC, DNC (Direct and Distributed), FMC, FMS; planning and programming CNC machine tools,. EDM and other forming machines, toolings of CNC machines; adaptive control systems, tool. and work handling systems involving robot, AGV and AS/RS and detailed part programming using G and M codes, APT, etc.

Robotics; types, anatomy, drives, kinematics, controls, and applications of the robot.

Automatic inspection systems, use of coordinate measuring machines (CMM), control systems, process monitoring.

Manufacturing from product design- concept of group technology (GT), CAD-CAM interface, CAPP, computer aided production planning and control.

References:

1. "Automation, Production Systems, and Computer-Integrated Manufacturing" M.P. Groover, Prentice Hall of India.
2. "CAD/CAM - Theory and Practice", Ibrahim Zeid, Tata McGraw-Hill PublishingCo. Ltd., New Delhi.
3. "CAD/CAM" - M. P. Groover and E. W. Zimmers Jr., Prentice Hall of India
4. "CAD/CAM/CIM"- P. Radhakrishnan, S. Subramanyan and V. Raju, New Age In ternational Publishers.
5. "Computer Aided Manufacturing"- P.N. Rao, N.K. Tewari and T.K. Kundra, Tata McGraw- Hill Publication.
6. "Robotics Technology and Flexible Automation"- S.R. Deb, Tata McGraw-Hill Publication.
7. "Industrial Robots and Computer Integrated Manufacturing"- S. Kumar, Oxford & IBH Publishing Co. Ltd.
8. "Computer-Aided Production Management"- P.B. Mahapatra, Prentice Hall of India.

PTM 202 : Non-Traditional Machining Processes

Structure : 4-0-0
Credit : 4

Non traditional machining: Introduction, Specific Applications and Advantages over Traditional Machining Processes.

Mechanical processes; Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, and Abrasive Water Jet Machining; Process details, parametric effects, recent advancements and modelling.

Thermal processes; Electro discharge Machining, Plasma Arc Machining, Electron Beam Machining, and Laser Beam Machining; process, parameters, recent advances and modelling.

Chemical and Electrochemical processes; Chemical Machining, Electro Chemical Machining and Electrochemical grinding.

Hybrid-type systems; Electro Chemical Discharge Machining, Ultrasonic assisted Electro Discharge Machining and other types,

Micro and Nano machining, Environment friendly machining.

References:

1. "Modern Machining Processes"- P.C. Pandey and H.S. Shan, Tata McGraw-Hill Publication.
2. "Non-Conventional Machining"- P.K.Mishra, Narosa Publishers.
3. "Manufacturing Science"- A.Ghosh and A.K. Mallik, E~st-West Publications.
4. "Laser Machining and Welding"- N. Rykalin, A. Uglov and A. Kokora, Mir Publishers, Moscow.
5. "Manufacturing Engineering and Technology"- S. Kalpakjian, Addison Wesley.
6. "Materials and Processes in Manufacturing"- E.P. DeGarmo, J.T. Black and R.A. Kohser, Prentice Hall of India.
7. "A Text Book of Production Technology" - O.P. Khanna and M. Lal, Dhanpat Rai and Sons.
8. "Rapid Prototyping: A BriefIntroduction"- A. Ghosh, East West Publication.
9. "Manufacturing Processes"- Amstead, Ostwald and Begeman, John Wiley and Sons.
10. "Micromachines", I. Fujimasa, Oxford University Press.
11. "Precision Engineering in Manufacturing", R.L.Murty, New Age International Publishers.

PTM 203 : Quality Assessment and Control

Structure : 4-0-0
Credit : 4

Basic concepts, definitions and history of quality control, Quality function and concept of quality cycle, Quality policy and objectives, Quality considerations in design, Economics of quality and measurement of the cost of quality, definitions, classifications, Quality Cost Matrix, Evaluation of Quality Costs.

Process control: Machine and process capability analysis. Use of control charts and process engineering techniques for implementing the quality plan.

Total Quality Control and Management, definition, vision and philosophy, Concepts of TQM, Concepts of customer centered environment, Golden Rules of TQM, the PDCA Cycle, Tools and Techniques, Implementation of TQM, Waste Elimination, the 5S campaign, Flow Chart, Pareto analysis, Cause and Effect Diagram, Force Field Analysis, Brain Storming, Quality Circle, Quality Function Deployment, Just-In- Time Approach, Quality Standards, ISO 9000 Standard, Implementation and Registration.

References:

1."Quality Control Handbook"- J. Juran, McGraw-Hill Book Company.
2. "Quality Planning and Analysis", M. Juran, F. M. Gryana, Tata McGraw Hill (3rd Edition), 1995
3. "Statistical Quality Control"- M. Mahajan, Dhanpat Rai publication
4. "Handbook of Total Quality Management"- R.P. Mohanty and R.R. Lakhe, Jaico Publishing House
5. "Total Quality Management" - D. H. Besterfield et. al., Pearson Education, Asia.
6. "Quality Control and Industrial Statistics"- A.J. Duncan, Richard D. Irwin Inc., USA.
7. "Introduction to ISO 9000 and Total Quality Management"- S. K. Ghosh, Oxford Publishing House, 1994

PTM 204(a) : Robot Application & Design

Structure : 4-0-0
Credit : 4

Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; robot classifications and specifications.

Robot kinematics, forward and reverse transformations, homogeneous transformation,

Robot Dynamics: Introduction to Force Analysis, Trajectory generation

Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots. Robot end-effectors- mechanical, magnetic and vacuum grippers, gripping forces RCC and design features of grippers. Robot sensors- contact and non-contact sensors, Robot vision and their interfaces.
Robot languages and programming techniques.

Applications of robots in materials handling, machine loading/unloading, inspection, welding, spray painting and finish coating, and assembly, etc.

Economic performance and evaluation strategies, Robot installation and planning. Safety features.

References:

1. "Introduction to Robotics"- J.J. Craig, Addison-Wesley.
2. "Fundamentals of Robotics Analysis and Control"- R.J. Schilling, Prentice Hall of India.
3. "Robotics Technology and Flexible Automation"- S.R. Deb, Tata McGraw-Hill Publication.
4. "Foundations of Robotics Analysis and Control"- T. Yoshikawa, Prentice Hall of India.
5. "Robotics for Engineers"- Y. Koren, McGraw-Hill Book Company, New York.
6. "Industrial Robots and Computer Integrated Manufacturing"- S. Kumar, Oxford & IBH Publishing Co. Ltd.
7. "Automation, Production Systems, and Computer-Integrated Manufacturing" M. P. Groover, Prentice Hall of India.
8. "Computer Aided Manufacturing"- P.N. Rao, N.K. Tewari and T.K. Kundra, Tata McGraw-Hill Publication.
9. "Robotics: Control, Sensing, Vision and.lntelligence"- K.S. Fu, R.C. Gonzales and C.S.G. Lee, McGraw Hill, 1997
10. "Analytical Robotics and Mechatronics", W. Stadler, McGraw Hill Book Co.

PET 204(b) : Computer Aided Design and Manufacturing

Structure	:	3-0-0
Credit	:	3

Basic concepts of product design. Different phases of computer aided design (CAD), integration of CAD-CAM, system software, benefits of CAD

Elements of interactive computer graphics (ICG); introducUon, point and line plotting and display techniques, 2D and 3D transformation, concatenation, clipping, segmentation, 2D and 3D graphics, input and output devices, raster scan graphics systems.

Geometric modeling; wire-frame, surface and solid modeling techniques.

Computer-aided drafting; drafting packages, dimensions, text, shading, hatching, etc.of mechanical components.

Engineering analysis; design reviews and evaluation.

Element of CAM/CIM systems; CNC Machines, DNC, FMS, Machining Centres, A.C. Systems, different handling and robotic configurations employed; Computer Integrated Production Planning and Control; MRP, MRP-II, CAPP, CAI and CAQC, Application of softwares. Interfacing of CAD with CAM; manufacturing data generated from CAD data.

References:

1. "CAD/CAM - Theory and Practice", Ibrahim Zeid, Tata McGraw-Hill PublishingCo. Ltd., New Delhi.
2. "CAD/CAM" - M. P. Groover and E. W. Zimmers Jr., Prentice Hall of India
3. "Computer Aided Mechanical Design and Analysis" - V. Ramamurti, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 3rd Edition.
4. "Mathematical Elements for Computer Graphics", D. F. Rogers and J. A. Adams, McGraw-Hill Publishing Co., Singapore, 2nd Edition.
5. "Principles of Interactive Computer Graphics", W. M. Newman and R. F. Sproull, Tata McGraw Hill Publishing Co. Ltd.,New Delhi, 2nd Edition.
6. "Schaum's Outlines of Theory and Problems of Computer Graphics" - Z. Xiang and R. Plastock, McGraw Hill, Singapore, 2nd Edition.
7. "CAD/CAM/CIM"- P. Radhakrishnan, S. Subramanyan and V. Raju, New Age In ternational Publishers.
8. "Computer Aided Manufacturing"- P.N. Rao, N.K. Tewari and T.K. Kundra, Tata McGraw- Hill Publication.
9. "Robotics Technology and Flexible Automation"- S.R.. Deb, Tata McGraw-Hill Publication.
10. "Industrial Robots and Computer Integrated Manufacturing"- S. Kumar, Oxford & IBH Publishing Co. Ltd.
11. "Computer-Aided Production Management"- P.B. Mahapatra, Prentice Hall of India.
12. "Automation, Production Systems, and Computer-Integrated Manufacturing" M.P. Groover, Prentice Hall of India.

PTM 204(c) : Industrial Tribology

Structure : 4-0-0
Credit : 4

Introduction to tribological systems, economic aspects, lubrication of bearings, friction control and wear prevention, properties and testing of lubricants, mechanisms of fluid flow- Reynold's equation and its limitations.

Idealized hydrodynamic bearing, plane slider bearings, journal bearings- finite and infinite, finite bearing, numerical solution, bearing design, fluid inertia and turbulence, hydrodynamic instability.

Squeeze film bearing, thrust and journal bearing, gas lubricated bearing, hydrodynamic bearings, hydrostatic bearings, porous bearings, elasto-hydrodynamic lubrication, solid lubricants.

Physico-mechanical interactions at interfacial contact, surfaces; Analysis and assessment of topography; tribo- models for asperity contact,' frictional resistance and wear; Frictional instability and stick-slip phenomenon; Models of adhesiondiffusion wear process; Kinetics of solid state interfacial interactions.

References:

1. "Lubrication"- R.C. Gunther, Baily Brothers and Swinfen Limited.
2. "Principles of Tribology" - Halling J. (Editor), Macmillan, London.
3. "Handbook of Tribology: Materials, Coatings and Surface Treatments"- B.Bhooshan and B. K. Gupta, McGrawhill, New York.
4. "Tribology Handbook"- M.J. Neale, Butterworth Publication
5. "Basic Lubrication Theory"- A.t. Cameron, Wiley Eastern Limited
6. "Introduction to Tribology of Bearings"- B.C. Majumdar, A.H. Wheeler and Co. Pvt.Ltd. Allahabad.
7. "Tribology: Friction and Wear of Engineering Materials"- LM. Hutchings, Edward Arnold, London.
8. "Engineering Tribology" - A.H. Williams, Oxford University' Press.
9. "Theory and Practice of Lubrication for Engineers"- Dudley D. Fuller, Jihn Wiley and Sons.
10. "Principles and Applications of Tribology"- D.F. Moore, Pergamon Press.
11. "Friction and Wear of Metals"- E. Rabinowicz, John Wiley and Sons.
12. "Bearing Design and Application"- D.F. Wilcock and E.R. Booser, McGraw-Hill.
13. "Fundamentals of Fluid Film Lubrication"- B.J. Hamrock, McGraw-Hill.
14. "Friction Wear Lubrication- Tribology Handbook (Vol-I,II,III)"- LV. Kragelsky and V.B. Alisin, Mir Publication, Moscow.

ENERGY MANAGEMENT AND AUDIT

PTM – 205 (a)

Structure : 4-0-0

Credits : 04

Introduction, Energy Scenario : Commercial and Non-Commercial Energy, Primary Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long term Energy Scenario, Energy and Environment : Air pollution, Climate Change, Energy Security, Energy Conservation and its importance, Energy Strategy for the Future, Sustainable Development.

Basics of Energy and its various forms : Electricity basics – DC & AC currents, Load Management and Maximum demand control. Thermal basics – Fuels, Thermal energy content of fuel, Sensible and Latent heat, Evaporation, Condensation, Steam, Humidity, Heat transfer.

Energy Management & Audit : Definition, Energy audit-need, Types of energy audit, Energy management (audit) approach – understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirement, Fuel and Energy substitution, Energy audit instruments.

Material and Energy balance : Methods for preparing process flow, Material and energy balance diagrams.

Financial Management : Investment-need, Appraisal and criteria, Financial analysis techniques – Simple pay back period, Return on investment, Net present value, Internal rate of return, Cash flows, Risks and sensitivity analysis; Financing options, Energy performance contracts and role of ESCOs (Energy Service Companies).

Energy Monitoring and Targeting : Defining monitoring & targeting, Elements of monitoring & targeting, Data and information analysis, Techniques – energy consumption, Production, Cumulative sum of differences (CUSUM).

Energy Performance Assessment of Furnace, Pumps, HVAC System, Variable Speed Drives, and Lighting System : Purpose, Performance terms and definitions, methods, efficiency calculation, factors affecting performances, Energy conservation opportunities.

Application of Non Conventional and Renewable Energy Sources : Different forms of renewable energies, Their applications for energy conservation.

Books :

1. Albert Thumann: Plant Engineers & Managers Guide to Energy Conservation (Fairmont Press)
2. Wayhe C. Tuner : Energy Management Handbook (Wiley Interscience Publication)
3. Anthony J. Pansini. : Engineering Economic Analysis Guide Book (Fairmont Press)
4. D. Paul-Mehta : Handbook of Energy Engineering. (Fairmont Press / Prentice Hall (Sd))
5. Paul O'Callaghan : Energy Management. (McGraw Hill Professional Publication)
6. Books of Energy Management & Auditors, Bureau of Energy Efficiency, (A Statutory body under Ministry of Power,Government of India)

PTM 205(b) : Supply Chain Management

Structure : 4-0-0
Credit : 4

Introduction: Understanding logistics and supply chain management (SCM); wholistic approach to physical flow; customer focus in SCM: efficient customer response (ECR), quick response (QR), accurate response (AR), corporate goal through competitive advantage, push and pull type system.

Inbound and Outbound Logistic: SCM integration considering material flow, information flow and cash flow; Bullwhip effect, transportation and warehousing.

Cost Analysis: Historical costing, standard costing and estimated costs, marginal costs, concept of cost drivers; activity based costing (ABC), through put accounting.

Benchmarking for SCM: Techniques of performance measurement and its barriers and evaluation of SCM.

Transportation and Warehousing Location: Multi-model transport operation, routing, scheduling, fleet size insurances, sales tax, outsourcing, 3rd and 4th party logistics.

IT and Its Applications in SCM: MRP, ERP, distribution resource planning (DRP/DRPB) and designing SCM.

Supply chain management in service sector, global market and global sourcing, supplier alliance, supplier quality control, supplier chain re-engineering.

Green supply chain management.

References:

1. "Supply Chain Management"- Martin Christopher, Fabrycky and Blanchand.

SESSIONAL SUBJECT

PTM 281 : Seminar and Assignment - II

Structure : 0-0-2
Credit : 1

Seminar would be based on literature review on some emerging areas related to this course. Seminar presentation would be made by an individual student, and a report would have to be submitted by each student separately.

Assignment would be given to each student by the teacher concerned on development of some model/ special software package/ set-up for laboratory experiments etc. Each student will have to submit a report and appear for the viva-voce.

PRACTICAL SUBJECT

PTM 291 : Manufacturing Process and Systems Laboratory

Structure : 0-0-3
Credit : 1

Experiments on computer aided manufacturing systems, such as;

- Part programming on a CNC lathe
- Part programming on a CNC milling / machining center
- Using MasterCAM for making ajob from AutoCAD drafting
- Computer Aided Process Planning
- Robotic Programming
- Electric Discharge Machining
- Testing for alignment/ error in machine tools
- Finding out speed ratios and constructing ray diagrams of machine tools. Machine Tool Vibration
- Mechatronic elements in automated machine tools
- Design of elements of machine tools

SEMESTER – III
SESSIONAL SUBJECTS

PTM – 381 : Pre – submission Defence of Dissertation
Structure : 0 – 0 – 0
Credit : 4

Project work would be of two – semester duration and one project would be allotted to one student . The project work done upto the end of the third semester would be evaluated and the evaluation will be internal evaluation . The total credit will be divided in the following way :

Synopsis – semester : 20 %
Thesis : 40 %
Viva : 40 %

PTM – 382 : Dissertation (Progress)
Structure : …….
Credit : 18

Viva voce of the project will be based on the project thesis to be conducted at the end of the semester – III .

SEMESTER – IV
SESSIONAL SUBJECTS

PTM – 481 : Dissertation (Completion)
Structure : 0 – 0 – 0
Credit : 18

Project work would be of two – semester duration and one project would be allotted to one student . The project work done upto the end of the fourth semester would be evaluated and the evaluation will be internal evaluation . The total credit will be divided in the following way :

Synopsis – semester : 20 %
Thesis : 40 %
Viva : 40 %

PTM – 482 : Post - submission Defence of Dissertation
Structure : 0 – 0 - 0
Credit : 6
Viva voce of the project will be based on the project thesis to be conducted at the end of the semester – Iv .

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