DELHI TECHNOLOGICAL UNIVERSITY
SCHEME OF TEACHING AND EVALUATION
MASTER OF TECHNOLOGY IN PRODUCTION ENGINEERING (PIE)

Semester-I

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE	Total Credits
Group A	1	PRD501	Theory of Metal Cutting	Core	4	3	0	2	15	25	20	40	-	
Group A	2	PRD503	Welding Processes & Metallurgy	Core	4	3	0	2	15	25	20	40	-	
Group B	3	PRD5401/5403/…………	Elective 1	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-	17
Group B	4	PRD5301/5303/…………	Elective 2	Elective	3	3	0	0	20	-	30	50	-	
Group B	5	PRD5201/5203/…………/ UEC5201/5203/…………	Elective 3/University Elective I	Elective	2	2	0	0	20	-	30	50	-	

Semester-II

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE	Total Credits
Group C	1	PRD502	Plasticity & Metal Forming	Core	4	3	0	2	15	25	20	40	-	
Group C	2	PRD504	Casting Technology	Core	4	3	0	2	15	25	20	40	-	
Group D	3	PRD5402/5404/…………	Elective 4	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-	17
Group D	4	PRD5302/5304/…………	Elective 5	Elective	3	3	0	0	20	-	30	50	-	
Group D	5	PRD5202/5204/…………/ UEC5202/5204/…………	Elective 6/ University Elective II	Elective	2	2	0	0	20	-	30	50	-	

Semester-III

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE	Total Credits
Group E	**Track 1**													12
	1	PRD651	Research Project	Core	12	0	0	12	0	-	0	100	-	
	Track 2													
	1	PRD601	Major Project I	Core	3						40	60		
	2	PRD6401/6403/…………	Elective 7	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-	
	3	PRD6301/6303/…………	Elective 8	Elective	3	3	0	0	20	-	30	50	-	
	4	PRD6201/6203/…………	Elective 9	Elective	2	2	0	0	20	-	30	50	-	

Semester-IV

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE	Total Credits
Group F	**Track 1**													12
	1	PRD652	Research Project	Core	12	0	0	12	0	-	0	100	-	
	Track 2													
	1	PRD602	Major Project II	Core	12	0	0	12	0	-	0	100	-	

LIST OF ELECTIVES :

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 1	1	PRD5401	Computer Aided Design / Computer Aided Manufacturing	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	2	PRD5403	Computer Integrated Manufacturing Systems		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	3	PRD5405	Mechatronics		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 2	1	PRD5301	Principles of Machine Tools	Elective	3	3	0	0	20	-	30	50	-
	2	PRD5303	Automation in Manufacturing		3	3	0	0	20	-	30	50	-
	3	PRD5305	Process Engineering		3	3	0	0	20	-	30	50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 3	1	PRD5201	Seminar	Elective	2	2	0	0	2	-	-	100	-
	2	PRD5203	Operation Research		2	2	0	0	20	-	30	50	-
	3	PRD5205	Optimization Techniques		2	2	0	0	20	-	30	50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 4	1	PRD5402	Metrology	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	2	PRD5404	Methods Engineering and Ergonomics		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	3	PRD5406	Composite Materials and Processing		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 5	1	PRD5302	Minor Project	Elective	3	0	0	-	-	-	40	60	-
	2	PRD5304	Maintenance Management		3	3	0	0	20	-	30	50	-
	3	PRD5306	Managerial Concept & Organizational Behaviour		3	3	0	0	20	-	30	50	-

	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 6	1	PRD5202	Industrial Quality Control	Elective	2	2	0	0	20	-	30	50	-
	2	PRD5204	Supply Chain Management		2	2	0	0	20	-	30	50	-
	3	PRD5206	Production & Operation Management		2	2	0	0	20	-	30	50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 7	1	PRD6401	Advanced Machining Processes	Elective	4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	2	PRD6403	Precision Engineering		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	3	PRD6405	Surface Engineering		4	3/4	0	2/0	15/20	25/0	20/30	40/50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 8	1	PRD6301	Robotics	Elective	3	3	0	0	20	-	30	50	-
	2	PRD6303	Design for Manufacturing and Assembly		3	3	0	0	20	-	30	50	-
	3	PRD6305	Reliability Engineering		3	3	0	0	20	-	30	50	-
	S. No.	Course Code	Course Name	Type/Area	Cr	L	T	P	CWS	PRS	MTE	ETE	PRE
Elective 9	1	PRD6201	IT in manufacturing Enterprise	Elective	2	2	0	0	20	-	30	50	-
	2	PRD6203	Materials Management		2	2	0	0	20	-	30	50	-
	3	PRD6205	Project Management		2	2	0	0	20	-	30	50	-

SEMESTER I

Courses

PRD501   Theory of Metal Cutting

Mechanics of single point and multipoint cutting and abrasive metal removal processes, cutting forces, analysis of work tool system as influenced by tool and work materials, tool geometry and environmental and process variables, Heat transfer and temperature distribution, cutting fluids, Mechanics of tool wear, Tool life, Economics of metal removal, surface finish and dimensional accuracy. Tool Design, Tool design consideration, Selection of tool materials, Tooling economics and safety as related to tool design. Design of Single point cutting tools, Design of Carbide and Ceramic tipped tools, Design of Chip breakers. Design of Multi point cutting tools, Design of Broaches, Twist drill, Reamers and Milling cutters.

Suggested Books:

1. Metal cutting principles by M C Shaw, Oxford University press
2. Metal cutting Theory and practice by A Bhattacharya, New Central Book Agency
3. Fundamentals of Metal Cutting and Machine Tools by B.L. Juneja, Nitin Seth, G.S. Sekhon, New Age Publishers

PRD503   Welding Process & Metallurgy

Arc, gas and resistance welding processes oxy-acetelyne and arc cutting of metals. Review of modern welding and cutting methods. Welding metallurgy, Heat and temperature during fusion welding, filler metal and metal transfer. Weldability of plain carbon, low alloy, austenitic and other nikel crome steels, Problems and procedure for welding non-ferrous alloys: electrode selection: Design of welded joints, Distortion, residual stresses and stress relieving. Weld defects, Non destructive testing.

Suggested Books:

1. Principles of Welding Technology by L.M. Gourd ELBS/ Edward Arnold
2. Welding processes & technology by Dr. R.S.Parmar, Khanna Publishers

PRD5401   Computer Aided Design / Computer Aided Manufacturing

Introduction to CAD/CAM, representation of curves, surfaces and solids for CAD/CAM applications, computational geometry for manufacturing, product design for manufacture and assembly, computer aided process planning, computer aided assembly planning, computer aided inspection & reverse engineering, manufacturing process simulation, virtual & distributed manufacturing, computer integrated manufacturing

Suggested Books:

1. CAD/CAM by Grover/Zhimmer, PHI

2. Computer Aided Manufacturing by Kundra, Rao, Tiwari , Tata McGraw HILL.

3. CAD/CAM by A J Medland and Piers Buounett, Springer

PRD5403   Computer Integrated Manufacturing Systems

Evolving manufacturing environment, New competitive challenges, Evolving Role Information Technology, CIM Systems: Flexibility, Integration and Automation Opportunities, Automation of information and manufacturing systems, Automation strategies, Towards Flexible Automation, Islands of automation, Evolution Towards CIM systems, Computer based integration between various functions - manufacturing, sales, design, materials etc Flexible Manufacturing Systems (FMS) as mini CIM, Computer Integrated Production Management, ERP, Group technology, Concurrent Engineering, Simulation and AI in CIM systems, CIM and Beyond.

Suggested Books:

1. CAD/CAM by Grover, Zhimmer, PHI

2. Computer Aided Manufacturing by Kundra, Rao, Tiwari , Tata McGraw HILL.

3. Optimization by Joshi and Moudgalya, Narosa

4. CAD/CAM by A J Medland and Piers Buounett, Springer

PRD5405   Mechatronics

Introduction to Mechatronic systems and components; Sensors and transducers; Actuators- electrical, electromechanical, electromagnetic, hydraulic, pneumatic, smart material actuators, micro actuators, nano actuators. Active actuators- piezoelectric, shape memory alloys(SMA), electro active polymers(EAP), magneto restrictive, magneto rheological fluid (MR); Stepper and servo motors, Encoders and resolvers; Modeling, analysis and simulation of dynamic systems; use of MATLAB; Bode, Nyquist and root-locus plot; Feedback systems: Open and closed loop control systems; Stability and sensitivity; PID, phase lag and phase lead compensation; Sampled data systems and Digital controllers; DA/AD converters, microprocessors, interfacing with computers; Digital logic: Analysis and synthesis of 6echatronic systems with application to robotics, CNC systems and others

Suggested Books:

1. Introduction to Mechatronics and Measurement systems by Alciatore David G., Tata-McGraw Hill India Ltd,
2. Mechatronics: Principles, Concepts and applications by Mahalik.N, Tata-McGraw Hill India Ltd.
3. Mechatronics: Principles and applications by Onwubolu, Elsevier India Pvt Ltd.

4. Mechatronics by W. Bolton, Pearson Education

PRD5301   Principles of Machine Tools

Kinematics of machine tool drives, stepped and stepless speed regulation, design of speed gear box, Design of beds, columns, slides etc., their strength and rigidity, design of spindles and bearings, Automatic and numerically controlled machine tools, Hydraulic drives testing of machine tools. Dynamics acceptance tests, Damping in machine tools, Modern trends in machine tool design, transfer machines.

Suggested Books:

1. Principles of Machine Tools by G.C.Sen and A. Bhattacharya, Central Publication
2. Fundamentals of Machining and Machine Tools by G Boothroyd, McGraw-Hill.

PRD5303   Automation in Manufacturing

Modern developments in automation in manufacturing and its effect on global competitiveness, Need and implications of automation in Manufacturing, different types of production systems and automation, hard/fixed automation. Hydraulic and pneumatic actuators, their design and control devices, sequence operation of hydraulic/pneumatic actuators, designing of systems with hydraulic/pneumatic, Electro Pneumatic & Electro Hydraulic Systems design, Relay Logic circuits, material handling systems, applications in manufacturing.

Suggested Books:

1. Hydraulic and Pneumatic Controls by Srinivasan R., Vijay Nicole imprints Pvt. Ltd., Chennai.
2. Introduction to Hydraulic and Pneumatic by Ilango S and Soundararajan V., Prentice-Hall of India, Delhi
3. Pneumatic Systems: Principles and Maintenance by Majumdar S.R., Tata McGraw-Hill, Delhi
4. Fluid Power with Applications by Esposito Anthony, Prentice Hall,

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PRD5305   Process Engineering

Understanding relation between geometry, materials and manufacturing in relation to process planning. Design for Manufacture and Assembly, Product life-cycle considerations, Selection of raw material geometries, process selection, selection of manufacturing equipment, process sequencing, tooling, work holding and In-process inspection. Process Planning for Assembly & Inspection, Computer Aided Process Planning, Lean concepts in manufacturing.

Suggested Books:

1. Introduction to Process Engineering and Design by Shuchen B. Thakore and Bharat I. Bhatt, McGraw-Hill
2. Manufacturing Engineering Processes by Leo Alting, CRC Press
3. Manufacturing Processes and system by Phillip F Ostwald, Wiley
4. Fundamentals of modern Manufacturing by Mikell P Groover, Wiley

PRD5203   Operation Research

Historical development, Nature of O.R. projects, Model Building Linear deterministic optimization models-linear Programming, Simplex Algorithm, Duality, Degeneracy, assignments, transportation and Trans-shipment models, post optimality analysis. Integer LP., Queing theory, elementary concepts of Dynamics Programming, and Inventory control. Game Theory and Markov Chains. Application of OR software's.

Suggested Books:

1. Operation Research by J. K. Sharma; Macmillan
2. Operations Research by Hamdi A. Taha, Pearson
3. Operations Research: Concepts and cases by F S Hiller and G J Liebermaan, TMH

PRD5205   Optimization Techniques

Introduction to Optimization; Introduction, Engineering Applications, Statement of an Optimization Problem, Classification; Linear Programming : Simplex Algorithm; Two Phase Method, Big 'M' Method, Revised Simplex Method, Duality in Linear Programming; Prime-Dual Relations, Duality Theorem, Dual simplex method, Sensitivity and Post Optimality Analysis. Transportation and Assignment Problem; Integer Programming – Branch and bound Method, Cutting Plane Method; Dynamic Programming: Elementary Concepts of Dynamics Programming, Multi stage Decision Process, Calculus Method and Tabular Method; Classical Optimization techniques – Unconstrained Optimization: Optimizing Single-Variable Functions, Optimizing Multi-Variable Functions. Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Lagrange Multipliers Method. Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn –Tucker Sufficient Conditions; Non-Linear Programming-Unconstrained Optimization Techniques: Direct search methods, Descent Methods. Constrained Optimizations: Direct and Indirect methods;Introduction to Advanced Optimization Techniques –Genetic Algorithms (GA), Simulated Annealing, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO) etc.

Suggested Books:

1. Optimization of Engineering Design by Deb, K., PHI
2. Operations Research by Hamdi A. Taha, Pearson
3. Operations Research by D.S. Hira, P. K. Gupta, S. Chand
4. Engineering Optimization by S S Rao, New Age international

5. Optimization Techniques by Chander Mohan, Kusum Deep, New Age International

SEMESTER II

PRD502   Plasticity and Metal Forming

Nature of plastic deformation, yield criteria, stress-strain relations in elastic plastic problems, work hardening, formulation of elastic plastic problems. Methods of analysis, slab method, slip line and extremum principles, Application to metal working operations like wire drawing, extrusion, rolling forging, spinning, sheet metal forming etc., study of metal flow, lubrication and wear in forming processes, formability, design of dies, high energy rate forming.

Suggested Books:

1. Fundamentals of Metal forming process by Juneja B.L., New age international Publishers
2. Principal of Industrial Metal working Processes by Rowe G.W, CBS publishers & Distributers
3. Manufacturing Science by Ghosh Amitabha & Mallik Kumar Asok, East-West Prem Pvt Ltd

PRD504   Casting Technology

Casting Processes, Classification, Characteristics of sand-casting processes, metal mould casting processes and casting processes using other mould/core materials, Characteristics and selection of molding sand; Bonding Theory. Solidification of castings, casting design considerations, gating system design, riser design, nucleation and grain growth, solidification of pure metals, short and long freezing range alloys. Rate of solidification, macrostructure and microstructure. Solidification contraction; Mould-metal interface reactions. Cast metals and alloys, Specific considerations to Grey CI, steel and non ferrous foundry practices. Inoculation and gas removal methods. Casting defects; their causes and their removal, inspection of castings. Quality control in foundries Metal matrix composites and their properties and suitability as casting materials. Special casting processes. Foundry mechanization pollution control in foundries, recent developments.

Suggested Books:

1. Foundry Engineering by Taylor H.F., M.C.Flemings and J.Wulff., John Wiley
2. Foundry Technology by Beely P.R. Butterworths, London
3. Principles of metal castings by Heine R.W., C.R. Loper and P.C Rosenthal, Mc Graw-Hill
4. Castings by Campbell. J, Butterworth-Heinemann, London
5. The science of Engineering Materials by Srinivasan N.K and Ramakrishanan S.J., Oxford and IBH Pub. Co, New Delhi

PRD5402   Metrology

Introduction to dimensional metrology, limits, fits and tolerances, application of tolerances, limit gauging, design of gauges, measuring instruments, comparators and their design considerations, angular measurements, auto collimators and interferometers. applications of dimensional inspection, measurement of screw threads, thread gauges for internal and external threads, gear inspection, inspection of surface quality, parameters for assessing surface finish and experimental methods of surface finish measurements, feature inspection, straightness, flatness, parallelism, squareness, circularity and roundness, automated dimensional measurements, automatic gauging, automatic measuring machines for inspecting multiple workpiece dimensions, measurement with coordinate measuring machines.

Suggested Books:

1. Fundamentals of Mechanical Inspection by R. Jenkins, McGraw Hill.
2. Fundamentals of Dimensional Metrology by C. Dotson, Cengage Learning
3. Engineering Metrology by I.C. Gupta, Dhanpat Rai Publications,
4. Engineering Metrology by R.K. Jain, Khanna Publishers,

PRD5404 Methods Engineering and Ergonomics

Definition, origin, scope and goals of ergonomics as a field of study. Examples of applications of ergonomics in design. Types of data from human at physical, physiological, cognitive and affective levels. Data gathering and analysis techniques. Use of descriptive and inferential statistics in ergonomic data. Applications of mean, median, mode and percentile in anthropometry. Use of anthropometry in workstation design. Human physiological potentials and limitations in terms of load carrying capacity. Concept of comfort, fatigue and stress. Design for the cognitive user. Concept of mental workload. Cognitive perspective in control panel design and graphical user interface design.

Suggested Books:

1. Motion and time study by Ralph M. Barnes, Wiley
2. Motion and time study by Benjamin W. Niebel, Richard D. Irwin, Inc.
3. Operations Research, by D.S. Hira, P. K. Gupta, S. Chand
4. Introduction to Ergonomics by Robert Bridger, CRC Press
5. Indusrial engineering and ergonomics: vision, concepts, methods and tools by Holger Luczak, Springer

PRD5406 Composite Materials and Processing

FRP composites – Fiber types, fiber forms and properties, matrices type and properties, lamina, laminate, orthotrophy, anisotrophy, composites. Macro and micro-mechanical analysis and properties, Failure theories; Tsai – Hill, Tsai-Wu Primary and secondary manufacturing of composites; Lay-up, Autoclave

Molding filament Winding, Pultrusion, Compression Molding, RTM, RIM, SRIM, machining, drilling and routing Metal matrix composites; Manufacturing route Design, Structural and testing, application Ceramic matrix composites; Manufacturing routes and application.

Suggested Books:

1. Mechanics of composite materials by Autar K. Kaw, CRC Press, New York
2. Mechanics of Composite Materials by Rober M. Joness, Mc-Graw Hill, Kogakusha Ltd.
3. Stress analysis of fiber Reinforced Composite Materials by Michael W, Hyer,Mc-Graw Hill International
4. Composite Material Science and Engineering by Krishan K. Chawla, Springer

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PRD5304   Maintenance Management

Introduction to maintenance management, Reliability basics,Asset criticality Analysis, Reliability centered maintenance, Basic maintenance models for age and time based replacement, block and group replacement, inspection and shock based replacement, imperfect maintenance models, Maintainability models, Availability models, Life cycle cost models, Simulation based approach for maintenance planning, Queuing models for maintenance planning, Models for condition monitoring, Models for Maintenance scheduling, Maintenance performance measurement, Asset management practices, Case studies.

Suggested Books:

1. Engineering Maintainbility by Dhillon,B.S., Prentice Hall of India, New Delhi
2. Logistics Engineering and Management by Blanchard, Benjamin, S., Pearson

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PRD5306   Managerial concepts & organizational behavior

The over-all concepts of the nature of management, emergence of management: new challenges; the dimensions of management, the functions of Manager, overview of the functional approach to management-planning, organizing, directing co-ordinating and controlling. Planning, policies, procedure and methods, decision-making. Organising :Organisation structure, principles and theories in orgnisation, departmentalization, vertical and horizontal growth in orgnisation, span of management, centralization and decentralization line and staff function, organisation as a social system-formal and informal organisation. Directing: Administrative communication, motivation and leadership. Delegation. Coordinating: Internal and external coordination, committee in management. Controlling: The process of control, techniques of control Philosophical considerations: Social responsibilities of management, Indian management : the power and influence of Indian management, the role of management associations. Influence of Social and Cultural factors in human behavior. Socio-metry, attitudes, values and norms and factors influencing manager's behavior.

Suggested Books:

1. Management & organizational behaviour by R B Rudani, Tata McGraw-Hill Education.
2. Organizational behaviour by Robbins S P, Judge T A and Sanghi S, Pearson
3. Organizational behaviour by Robbins S P, Pearson

PRD5202   Industrial quality control

Introduction: Quality basics and history, Quality Philosophy (Deming, Juran, Crosby), Dimensions of quality, Quality Costs: Quality Cost Measurement, Utilizing Quality Costs for Decision-Making. Seven QC Tools: Histogram, Pareto Diagrams, Check Sheet, Cause-Effect Diagrams, Scatter Diagrams, Control Charts and Stratification. Statistical Process Control: Control Charts for Variables; Definitions, Variation: Common vs. Special Causes, Control Chart Techniques, X-bar and R chart, X-bar and S charts, Control Chart Interpretation and Analysis, Process Capability, Other Variable Control Charts; Individuals and Moving Range Charts, Moving Average and Moving Range Charts; Control Charts for Attributes: Definitions, Control Charts for Non-conforming Units, Control Charts for Counts of Non-conforming Units; Sampling Techniques: Single, Double, Multiple, Sequential Sampling Techniques, LTPD, AQL, AOQL; Quality Systems: ISO 9000, ISO 14000, ISO 18000, Six Sigma, Certification Requirements, Evolving Standards; Reliability: System concepts in reliability, availability and maintainability (RAM) Engineering, Fundamentals of reliability, Failure distributions,   System reliability assessment. Reliability of repairable by Markov approach. Point, mission and steady state availability. Availability assessment. Maintainability and its assessment; Advanced Topics: Quality Function Deployment, Design of Experiments, Benchmarking and Auditing.

Suggested Books:

1. The Management and Control of Quality by J R Evans and W M , Lindsay, Cengage learning, India
2. Total Quality Management by Besterfield, Pearson Education.
3. Statistical Quality Control by Douglas C. Montgomery, Wiley India Pvt Ltd
4. An Introduction to Reliability and Maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill

PRD5204   Supply chain management

Supply Chain Management: Concepts, theoretical background and managerial issues, Inventory Management and Risk Pooling, Demand Forecasting, Aggregate Planning and MRP, Network Planning, Distribution Strategies, Smart Pricing, Supply Chain Integration, Vendor Development, Procurement and Outsourcing Strategies, Strategic Alliances, Value of Information and IT in SCM, Coordinated Product and supply chain Design, Global Supply Chain, Customer Value and Performance Measurement of Supply Chain.

Suggested Books:

1. Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies by David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi and Ravi Shankar, Tata McGraw-Hill, 2008

2. Supply Chain Management: Strategy, Planning, and Operation by Sunil Chopra and Peter Meindel, Prentice Hall of India.
3. Principles of SCM: A Balanced Approach by Wisner, JD, Leong GK and Tan, KC, Cengage Learning.
4. Supply Chain Management by Janat Shah, Pearson Education

PRD5206   Production & Operation management

Introduction to Production & Operation Management, Management functions of an organization, job design and work measurement: job design decisions, approaches to job design, work measurement standards, learning curves, and its application.   Work flow systems; pull & push systems, MRP-I MRP-II, cellular manufacturing and FMS, CIMS, JIT manufacturing, automated production lines, line balancing, facility layout, bottleneck and balance matching, capacity management, Management of professional services. Aggregate planning: aggregate units of production cost in aggregate planning, leave of production strategy, mixed strategy, mathematical model, linear decision rule, master production scheduling shop scheduling, shop floor control, manpower scheduling DRP & demand management.

Suggested Books:

1. Production & operation Management by Chase, Aquilano ,Jacobs –TMH
2. Production & operation Management by James Dilworth, Pearson International
3. Production & operation Management by Jay Heizer, Barry Render, Prentice Hall
4. Production & operation Analysis by Steven Wanmias, McGraw Hill

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SEMESTER III

PRD6401   Advanced Machining Processes

Introduction to advanced machining processes – need for such processes and application areas Mechanical Energy utilized advanced machining processes like ultrasonic machining, abrasive flow machining, magnetic abrasive finishing, magneto-rheological finishing, abrasive water jet machining - mechanics of cutting, process parametric analysis, process capabilities, applications; Thermoelectric based advanced machining processes like electro discharge machining, wire EDM, Plasma Arc Machining, Laser Beam Machining, Focused Ion Beam Machining – working principles, material removal mechanisms, process capabilities and applications; Electrochemical and Chemical Advanced Machining – ECG; Electro stream Drilling, Chemical Machining – process characteristics, numerical modelling of the processes, applications and limitations.

Suggested Books:

1. Advanced machining process by Dr. V. K. Jain, Allied Publisers Pvt Ltd
2. Modern manufacturing process by Pandey & shan, Tata McGraw-Hill

PRD6403   Precision Engineering

Introduction – Precision, Accuracy & Smoothness – Need – Development of overall machining precision-Classes of achievable machining Accuracy-Precision machining-High precision Machining-Ultra precision Machining-application of precision machining- Materials for tools and machine elements – carbides – ceramic, CBN & diamond-Tool and work material compatibility; Precision machine element- Introduction – Guide ways – Drive systems – Spindle drive – preferred numbers - Rolling 83 elements – hydrodynamic & hydrostatic bearings –Hybrid fluid bearings- Aero static and aero dynamic bearings-Hybrid gas bearings-materials for bearings; Error control- Error – Sources – Static stiffness – Variation of the cutting force – total compliance – Different machining methods – Thermal effects – heat source – heat dissipation – Stabilization – decreasing thermal effects – forced vibration on accuracy – clamping & setting errors – Control – errors due to locations – principle of constant location surfaces; Precision manufacturing-Micro machining processes-diamond machining - micro engraving - Micro replication techniques-forming-casting-injection moulding - micro embossing - Energy assisted processes - LBM, EBM, FIB, Micro electro discharge machining-photolithography-LIGA process- Silicon micro machining-Wet and dry etching-thin film deposition; MEMS Introduction – MEMS –characteristics- principle – Design – Application: automobile, defence, health care, Industrial, aerospace etc.,

Suggested Books:

1. Precision Engineering by Venkatesh V.C. and Izman S., Tata McGraw Hill
2. Precision Engineering by Murthy R. L., New Age International
3. Principles of Precision Engineering by Nakazawa H., Oxford University Press

PRD6405   Surface Engineering

Introduction to surface engineering – importance and scope of surface engineering, conventional surface engineering practices like pickling, grinding, buffing etc., surface engineering by material addition like electroplating, surface modification of ferrous and non-ferrous materials like nitriding, cyaniding, aluminizing etc. Advanced surface engineering practices like laser assisted surface modification, electron beam assisted modification, spraying techniques like fame and plasma spraying, high velocity oxy-fuel, cold spray techniques. Sputter deposition processes, PVD and CVD methods of surface coatings, surface modification by ion implantation and ion beam mixing Characterization of the engineered surface and coatings like thickness, porosity and adhesion of coatings, surface microscopy and spectroscopic analysis of the modified surfaces. Functional coatings and their applications.

Suggested Books:

1. Introduction to surface engineering and functionally engineered materials by Peter Martin, John Wiley and Sons
2. Tribology and Surface Engineering by J. Paulo Davum, Nova Science Publishing.
3. Material and Surface Engineering in Tribology by Jamal Takadoum, Wiley

PRD6301   Robotics

Introduction: Brief History, Types of robots, Overview of robot subsystems, resolution, repeatability and accuracy, Degrees of freedom of robots, Robot configurations and concept of workspace, Mechanisms and transmission, End effectors and Different types of grippers, vacuum and other methods of gripping. Pneumatic, hydraulic and electrical actuators, applications of robots, specifications of different industrial robots.

Kinematics of Robots: Transformation Matrices, Inverse transformation matrices, Forward and Inverse kinematic equation for position and orientation, Denavit-Hartenberg representation of robot, inverse kinematic solution for articulated robot,

Dynamic analysis of Force: Lagrangian and Newtonian mechanics, Dynamic equations for multiple –DOF Robots, Trajectory Planning: Basics of Trajectory planning, Joint space trajectory planning, Cartesian Space trajectories.

Robot Programming languages & systems: Introduction, the three level of robot programming, requirements of a robot programming language.

Topics on state of the art technology based on latest research papers may be discussed.

Suggested Books:

1. Fundamental Concepts and Analysis by Ghosal A., Robotics, Oxford
2. Introduction to Robotics Analysis by Niku, S. B., Pearson Education
3. Introduction to Robotics: Mechanica and Control by Craig, J. J., Addison-Welsey
4. Fundamentals of Robotics, Analysis and Control by Schilling R. J., PHI
5. Robotics Control, Sensing, Vision and Intelligence by Fu, K, S., Gonzalez R. C., Lee C.S. G., McGraw Hill

PRD6303   Design for Manufacture and Assembly

Product design for life-cycle, concurrent engineering, design for manufacture, rule-based and plan based DFM, automated manufacturability assessment, Automated manufacturability assessment, commonly used tools for design for manufacture and assembly tools including, QFD, POKA YOKE, FMEA, Design for manual assembly and automated assembly, design for environment, Industrial and real life case studies of design for manufacture and assembly.

Suggested Books:

1. Designing for Manufacturing by Harry Peck, Pitman Publications
2. Engineering Metrology by R.K. Jain, Khanna Publication

PRD6305   Reliability Engineering

Introduction: System concepts in reliability, availability and maintainability (RAM) Engineering, Practical applications of RAM Engineering to systems, products and processes; Concepts, terms and definitions; Failure rate function, Probability density function, Cumulative distribution function, reliability

function, Mean time to failure (MTTF), MTBF, MTTR etc; Fundamentals of reliability: Failure distributions; Exponential, Weibull, Normal and Lognormal; Constant failure rate model and time dependent failure models; System reliability assessment: Series, Parallel, Combined series-parallel configurations; Cut sets and path sets approach, fault tree analysis (FTA); State dependent systems; Markov analysis, load sharing system, standby system, degraded system, Monte Carlo simulation; Design for Reliability and reliability improvement: Reliability specifications and system measurements, reliability allocation ; exponential case, optimal allocations, arnica method, AGREE method, Various types of redundancies; active and passive redundancy, k-out-of-n- redundancy, standby redundancy, optimization , reliability-cost trade off; Availability and maintainability: Point, mission and steady state availability; Availability assessment, Maintainability and its assessment; Maintenance policies: individual policy, Planned, preventive and condition based maintenance; Opportunistic maintenance policy; Design for maintainability: Maintenance requirements, measurements and specifications, fault diagnosis, failure mode and effect analysis (FMEA), Parts standardization and interchangeability, modularization, accessibility, repair versus replacement, proactive maintenance, maintainability prediction and demonstration.

Suggested Books:

1. Reliability Engineering by Srinath, L. S., East –West Press Ltd., New Delhi
2. Engineering Maintainbility by Dhillon, B. S., Prentice Hall of India, New Delhi

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PRD6201   IT in manufacturing Enterprise

Production Systems, Manufacturing Enterprises as Systems, Appreciate the evolving manufacturing environment and multi-attributed competition: IT role Challenges and Opportunities, Evolving Role of Information Technology in Enterprises: P&I Implications, Technology Management Challenges, Technical Fundamentals: MIS in Manufacturing Enterprises, FMS (Flexible Manufacturing Systems), CIM Systems, Intelligent Manufacturing Systems, Concurrent Engineering and Extended Enterprises, ERP (Enterprise Resource Planning), E-Business and Supply Chain Management, Discrete Event Simulation and AI Applications in manufacturing enterprises, Implementation Issues, Future Trends, Careers etc.

Suggested Books:

1. Information Technology Project Management by Kathy Schwalbe, Cengage
2. Analysis of Manufacturing Enterprises by N Viswanadham, Springer
3. Information Technology for Manufacturing by Kevin Ake, John Clemons, Mark Cubin, Bruce Lilly, CRC press

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PRD6203   Materials Management

Scope of materials management, integrated materials management, relation with other functional areas of organization; organizations of materials management, conventional and modern approaches to organizing materials management; Classification, codification, standardization and variety reduction of materials, Inventory control techniques: ABC, VED, FSN; Inventory models; Store Management; Vendor development; Make-Buy decision; Future Trends, etc.

Suggested Books:

1. Purchasing & Supply Management by Dobler & Burt, McGraw-Hill
2. Purchasing & Supply Chain Management by Monczka, Trent & Handfield, Cengage
3. Materials Management by A K Chitle & R C Gupta, PHI
4. Inventory Management by D C Bose, PHI
5. Materials Management by P Gopalakrishnan & M Sundersen, PHI

PRD6205   Project management

Introduction-Definitions, classifications, and scope of project management; project life cycle and uncertainty; Project planning-Scope, problem statement, project goals, objectives, success criteria, assumptions, risks, obstacles, approval process, projects and strategic planning; Project implementation-Project resource requirement, types of resources: men, materials, finance, resource distribution; Project monitoring-Evaluation, control, project network technique, planning for monitoring and evaluation, project audits, project management information system, Nature of project inventory, supply and transportation of materials, use of Material Requirement Planning. Project scheduling, PERT & CPM, project communication; Project team management-Recruitment, organizing, human resources: team operating rules, project organization, various forms of project organizations, project organization charting, project contracts, principles, compilation of contracts, practical aspects, legal aspects, global tender, negotiations, insurance; Project completion-Closing the project, types of project termination, strategic implications, project in trouble, termination strategies, evaluation of termination possibilities, termination procedures, post project reviews.

Suggested Books:

1. Project Management by Harold Kerzner, Wiley
2. Project Management by Dennis Lock, Gower Publishing Ltd
3. Project Management by Gopalakrishnan, Mcmillan India Ltd,
4. Project Management by Arun Kanda, PHI