

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

## **Industrial Production Engineering, VII-Semester**

### **IP-7001 Production Management**

#### **Theory :**

1. Production Management : Introduction, Systems Concept, Difference between Production & Operations management, Decisions, Organization, Objectives, and Historical review, Types of production system,
2. Facility Planning : Plant Location, Plant Layout Analysis & Evaluation, Material Handling equipments and facility design Procedures such as CORELAP, CRAFT etc. PPC Functions, Organization, Make or Buy decision, Forecasting methods.
3. Aggregate Planning : Introduction, Strategies of Aggregate Planning, Graphic and Charting methods, Transportation and HMMS method, Master Production Scheduling. Scheduling and Sequencing : Factors affecting scheduling and its approaches, Grantt Chart, Algorithms for jobshop and flow shop, Line Balancing, LOB.
4. Materials Management : Objectives, Organization, Functions. Purchasing: Principles, Methods, Procedure. Stores Management: Functions, Location of Stores. Inventory Models, Systems, and Selective Inventory Control and Just – In – Time system of manufacturing, Material Requirement Planning and Capacity Requirements Planning, Introduction to MRP II.
5. Maintenance Management : Types of maintenance strategies, Breakdown and Preventive Maintenance, Predictive and Total Productive Maintenance, Condition monitoring, Individual and Group replacement policies.

#### **Books Recommended:**

1. Chase Aquilino Jackobs, Operations Management, McGraw Hill.
2. Charry S. N., Production and Operation Management, McGraw Hill.
3. Adam Ebert, Production and Operation Management, PHI.
4. Eilon S., Production Planning and Control, McMillan Pub. .
5. A.K. Chitale and R.C. Gupta, Materials Management, PHI
6. G. K. Agrawal, Plant Layout and Material Handling, Jain Pub.

#### **References Recommended:**

1. Gaither Norman, Operations Management,
2. Dillworth James, Operations Management, McGraw Hill.
3. RitzmanKrajwaski, Operations Management, McGraw Hill.

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## **Industrial Production Engineering, VII-Semester**

### **IP-7002 Product Management**

1. Product Design : Product specifications, concept development, configuration design involving synthesis, analysis and optimization, Detailed design, Presentation of design Oral and Visual presentations, various types of models used in product design, Design through creative routes, Adaptive and variant design, Concurrent Engineering.
2. Design for manufacturing and Design for assembly, Role of Aesthetics and Ergonomics in design. Design for Environment. Robust Design using Taguchi methods, Reliability based design. Modular versus integral design.
3. Value analysis-scope techniques and job plan, Standardization, Renard series, Simplification visa - vis Variety in products .Patents, copyright and Intellectual Property Rights.
4. Marketing Management: Philosophies of Marketing, Market and Product strategies, BCG matrix, Portfolio management, New Product development strategy.
5. Marketing channels, Pricing strategies and Promotional strategies, Consumer behavior, Sales Management, Planning of sales, Sales skills, evaluation and promotion, Advertising methods, preparation of advertising briefs.

### **Books &References Recommended :**

1. Chitale A. K. and Gupta R. C., Product Design and Manufacturing, PHI.
2. Gupta V., Lal G.K. and Reddy ,”Fundamentals of Design and manufacturing” Narosa Publishing.
3. James Garrat, Design & Technology, Cambridge University Press.
4. Dieter, Engineering Design, Marketing Management, PHI.
5. Kolter, Philip, Marketing Management, PHI.
6. Stanton, Principles of Marketing, Prentice Hall.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

## **Credit Based Grading System**

### **Industrial Production Engineering, VII-Semester**

#### **IP-7003 CIM & Automation**

1. Fundamentals of Manufacturing and automation and production economics: Manufacturing industries, Types of production, Functions in Manufacturing, Organization & information processing in Manufacturing, Plant layout, Production concepts and mathematical models automation strategies. Methods of evaluating investment alternatives, Costs in manufacturing, Break even analysis, unit cost of production, Cost of manufacturing, Lead time, Work in process, Difficult to quantity factors.
2. High volume production systems: Automated flow lines, Methods of work part transport, Transfer mechanism, Buffer storage, Control functions, Automation for machining operations design & fabrication consideration. Analysis of transfer lines, Partial automation, Automated flow lines with storage buffers, Computer simulation of automated flow lines.
3. Numerical Control : Concepts and Types, Position and motion control, Constructional features of NC machines, CNC, DNC and Machine Center, Adaptive Control. Programming of CNC Machines MIRAC and TRIAC. Machine axis definition, Programming words EIA codes. CNC canned cycles G71, G72, G73, G74, G90, G92, G94 for CNC lathe. Absolute and Incremental Programming. Canned cycles of CNC milling machine.
4. Computer assisted Part Programming, APT, The APT System, Continuous Path Part Programming, Geometry Statements, Part Programming and Debugging, Computations APT : Decisions and Looping, Subscripted Variables, Macro Definitions, Characteristics and Limitations of Macro. Introduction to Multi-axis Programming. Pocket machining methods, Surface Machining methods. Automated Part Program generation .
5. Computers Integrated Manufacturing Definition, CIM wheel concept, Evolution of CIM, CIM and systems view of manufacturing, and CIM IT & concurrent engineering, Economic Impact of CIM and Scale Dynamics. Rapid Prototyping Technologies : Stereolithography, Selective Photocuring, Selective sintering, Fused Deposition Modeling, Laminated Object Manufacturing, 3D Printing, Applications of RP techniques, Emerging Techniques in RP, RP Methodology, Rapid Tooling. Process capability of RP and RT methods. Types of coordinate measuring machine, Components of CMM, Application Software of CMM, Accuracy of CMM, linear, volumetric and system probing error, Error measurement and Correction. Calibration of CMM

#### **Books & References Recommended :**

1. Automation, Production systems and CIM, by Mikell P Groover, Pearson Prentice Hall Singapore
2. CAD/CAM Principles & Applications, By P N Rao, Tata McGraw-Hill Publishing Company.
3. Computer Aided Manufacturing, by Tien-chien Chang, Richard Wysk & Hsu-Pin Wang, PHI India

4. Fundamentals of CAD/CAM/CIM, by Vikram Sharma, S K Kataria & Sons New Delhi
5. Zeid, CAD/CAM Theory & Practice, McGraw-Hill
6. Numerical Control Programming in APT Irvin H Kral Prentice Hall
7. CNC Programming Manual TRIAC
8. CNC Programming Manual MIRAC

**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7004 (1) Project Management**

**Unit 1 Concepts of project management:** Meaning, definition and characteristics of a project, technical and socio-cultural dimensions; project life cycle phases, project planning and graphic presentation; work breakdown structure, manageable tasks; size of network; blow down NW; identity and logic dummy activity; Fulkerson rule for numbering NW; time-scaled NW

**Unit-2 NW analysis:** PERT network; mean time and variances; probability to complete PERT project in specified time; CPM network; Event Occurrence Time (EOT); activity start/finish times; forward and reverse path calculations, concept and calculation of floats; resource allocation and critical-chain; overview of MS-project-2000.

**Unit-3 Project duration and control:** Importance and options to accelerate project completion; time cost tradeoff; fixed variable and total costs; use of floats and cost optimization; project performance measures; project monitoring info and reports; project control process; Gant chart and control chart; cost-schedule S-graph; planned cost of work schedule (PV), budgeted/ earned cost of work completed (EV) and actual cost of work completed (AC); schedule and cost variances (SV, CV) forecasting final project costs.

**Unit-4 Project organization, culture and leadership:** projects within functional organization; dedicated project/ task-force teams; staff, matrix and network organization; choosing appropriate project organization; Organization culture; ten characteristics; cultural dimensions supportive to projects; social network and management by wandering around (MBWA); different traits of a manager and leader; managing project teams; five stage team development model; shared vision; conflicts; rewards; rejuvenating project teams; project stakeholders; concept of project partnering.

**Unit-5 Strategic planning and project appraisal:** Capital allocation key criteria; Porters competitive strategy model; BCG matrix; Strategic Position Action Evaluation (SPACE); time value of money; cash flows; payback period; IRR; cost of capital; NPV; social cost benefit analysis; UNIDO approach; project risks and financing.

**References:**

1. Prasana Chandra: Projects: planning Implementation control; TMH.
2. Gray Clifford F And Larson EW; Project The managerial Process; TMH
3. Panneerselvam and Serthil kumar; Project management, PHI
4. Burke ; Project Management-Planning and control technics; Wiley India
5. Kamaraju R; Essentials of Project Management; PHI Learning
6. Jack R. Meredith, Project Management: a managerial approach, Wiley.
7. Choudhary ;Project Management; TMH
8. Srinath LS; PERT And CPM Principles and Appl; East West Press
9. Richman L; Project Management: Step By Step; PHI Learning
10. United Nations Industrial Development Organisation, Guide to practical project appraisal - social benefit cost analysis in developing countries, oxford & ibh

**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7004 (2) Financial Management**

**Unit 1 Working capital management:** Determination of level of current assets; sources for financing working capital; bank finance for working capital; working capital financing; short and long term financing of working capital; working capital leverages

**Unit 2 Cash Management:** Forecasting cash flows; cash budgets, long-term cash forecasting; monitoring collections and receivables, optimal cash balances; Baumol model, Miller- model, Stone model; strategies for managing surplus fund.

**Unit 3 Capital structure decisions:** Capital structure & market value of a firm; theories of capital structure; NI approach, NOI approach, Modigliani Miller approach, traditional approach; arbitrage process in capital structure; planning the capital structure: EBIT and EPS analysis. ROI & ROE analysis; capital structure policy

**Unit 4 Hybrid Financing:** Preferred stock, warrants and convertibles, private equity; venture funds, angel financing; financial management in intangible-intensive companies; characteristics of intangibles, implications for financial managements, types and approaches to valuations of intangible assets.

**Unit 5 Corporate financial modeling:** Agency problem and consideration; effect of inflation on; asset value, firm value, returns; financial planning; basis of financial planning, sales forecast method, proforma P & L account method, pro-forma balance sheet method, determination of External Financing Requirement (EFR).

**Unit 6 Financial Management of sick units:** Definition of sickness, causes, symptoms, predictions, revival strategies, institutions for revival of sick units; Economic Value Added (EVA) concept, components of EVA; Market Value Added (MVA).

**References:**

1. Prasanna Chandra; Financial Management; TMH
2. Khan M.Y.& Jain P.K; Financial Management; TMH
3. Pandey I.M; Financial Management; Vikas,
4. Brigham & Ehrhardt, Financial Management-Theory & Practice; Thomson Learning,
- 5 Ross, Westerfield & Jaffe; Corporate Finance– TMH
- 6 Bhat Sudhindra; Advanced Financial Management; Excel Books.
- 7 Vanhorne; Financial Management & Policy; Pearson / PHI
- 8 Keown, Martin, Petty. Scott; Financial management-principles and applications; PHI
- 9 Brearly and Myers; Principle of Corporate Finance; TMH

**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7004 (3) Material Management**

**Unit-1 Purchasing:** Functions, objectives of material management (MM); integration concept and production control; inspection; material classification and coding; importance of writing specifications in MM; standardization and variety reduction techniques; forecasting in purchasing, material planning importance and techniques; master and material budgets; organization of purchase department, qualities of materials manager; mass production purchasing, how much to buy at one time; methods of purchasing, purchasing procedures, purchasing problems; vendor evaluation and rating, computerized purchasing systems, purchasing in government organizations.

**Unit-2 Stores management:** Introduction, objective of store keeping, stores functions, stores organization, stores systems and procedures, stores accounting and verification systems, stores location and layout, factor affecting location, centralized and decentralized storing, automated/retrieval storage.

**Unit-3 Material Handling:** Planning and operating principles material handling equipments and classification; belt conveyer, chain conveyers, fork lifts, over head cranes, automated material handling in modern industries.

**Unit 4 Inventory models:** Necessity of inventory in process and safety stock, problem of excess inventory and cycle time (=WIP/ Throughput), JIT/ lean mfg; basic EOQ/ EPQ models for constant review Q-system(S,s); periodic review, base stock P-system; service level, lead time variance and safety stock;; ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP to ERP

**Unit-5 Miscellaneous:** Make or buy decisions; outsourcing benefits and risks; dependency on capacity and knowledge; modular and integral products; framework for make/ buy decision based on dependency and modular/ integral products; buyer-seller relationships in conventional and JIT purchasing; negotiations and its planning; tactics and stages in negotiations; disposal of surplus and obsolete material; performance appraisal of MM department.

**References:**

1. Gopalkrishnan P; Purchasing and materials management; TMH
2. Chitale AK and Gupta RC; Materials Management; PHI
3. Levi DS, ES, Kaminsky P; Designing and managing the Supply Chain; TMH
4. Vollman, Berry etal; Mfg Planning and control for SCM; TMH

**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7005 (1) Reliability and Maintenance Engineering**

Reliability :Definition, Failure patterns of complex product, measurement of reliability, Mean Time between failure and mean repair time, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA., Hazard analysis, system reliability- components in series, parallel & mixed system.

Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, r-out-of-n structure, Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability, Method of improving reliability during design, different techniques available to improve reliability, Reliability – Cost trade off, Prediction and analysis, Problems.

Maintenance Systems: Fixed time maintenance, Condition based maintenance, Opportunity maintenance, design out maintenance, Total productive maintenance, Inspection decision – Optimal inspection frequency, non-destructive inspection, PERT & CPM in maintenance, Concept of terotechnology. Replacement decisions – Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference, Optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown, Techniques available to improve maintainability & availability, trade off among reliability, maintainability & availability and analysis.

Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, concept of S/N ratio, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies, Examples of monitoring and diagnosis.

**Books & References Recommended :**

1. Reliability Maintenance and safety Engineering A K Gupta University science press
2. Balagurusamy, Reliability Engg., T.M.H.
3. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F. Coombs McGraw Hill Inc.
4. Failure Diagnosis and Performance Monitoring L.F. Pau Marcel Dekker
5. Industrial Maintenance Management S.K. Srivastava S. Chand & Co Ltd.
6. Management of Industrial Maintenance Kelly and M.J. Harris Butterworth and Co.
7. Maintenance, Replacement and Reliability A.K.S. Jardine Pitman Publishing
8. Engineering Maintainability: How to Design for Reliability and Easy Maintenance B.S. Dhillon Design for Reliability and Easy Maintenance B.S. Dhillon



**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7005 (2) Industrial Tribology**

**Introduction to Tribology** contact of solids, Nature of surface interaction

**SURFACES AND FRICTION:** Topography of engineering surfaces, contact between surfaces, sources of sliding Friction Energy dissipation mechanisms Friction Characteristics of metals, Friction of nonmetals. Friction of lamellar solids friction of Ceramic materials and polymers Rolling Friction, Source of Rolling Friction, Stick slip motion, Measurement of Friction.

**WEAR:** Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals -Abrasive wear – Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Brittle Fracture - wear - Wear of Ceramics and Polymers - Wear Measurements.

**LUBRICANTS AND LUBRICATION:** Types and properties of Lubricants - Testing methods -Hydrodynamic Lubrication – Elasto-hydrodynamic lubrication- Boundary Lubrication – Solid Lubrication- Hydrostatic Lubrication.

**FILM LUBRICATION THEORY:** Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings – Reaction torque on the bearings - Virtual Co-efficient of friction - The Sommerfeld diagram.

**BOOKS:**

1. A. Harnoy “ Bearing Design in Machinery “Marcel Dekker Inc, New York
2. M.M.Khonsari&E.R.Booser, “ Applied Tribology”, John Willey & Sons, New York
3. E.P.Bowden and Tabor.D., " Friction and Lubrication ", Heinemann Educational Books Ltd.,
4. A.Cameron, “Basic Lubrication theory ", Longman, U.K..
5. M.J.Neale (Editor), “Tribology Handbook ", Newnes. Butter worth, Heinema

**Industrial Production Engineering, VII-Semester**

**Elective –III IP-7005 (3) Plant Safety Engineering**

1. **Introduction** : History of development of industrial safety, implementation of factories Act, formation of various councils, safety and productivity, Safety organizations, safety committees structure, roll of management and roll of Govt. in industrial safety, safety analysis.
2. **Operational Safety (Hot Metal Operation)**: Safety in cutting safety in welding. Safety in Boilers Pressure vessels Furnace (all types) Heat Treatment processes shops Electroplating Grinding Forming process Rolling Forging Surface hardening Casting Moulding Coiling. Operational safety (Cold metal operation): Safety in handling of portable power tools Hand grinder machine shop drilling polishing machine-Safety in assembly shop Material handling Dock safety – Safety in generation and distribution of power Distribution and handling of industrial gases – Safety in inspection – Safety in chemical laboratories Ammonia printing- Safety in power press – Safety in Sewage Disposal and cleaning. Safety in Industrial pollution and control, safety in working at height.
3. **Accident prevention and protective equipment**: Personal protective equipment surveying the plant for locations and hazards part of body to be protected. Education and training in safety Prevention of causes and cost of Accident. Housekeeping First Aid Fire fighting equipment Accident reporting investigations. Hazard identification and risk control, FMECA, Industrial psychology in accident prevention safety trials, safety audit.
4. **The Acts which deal the safety and industrial Hygiene**: Features of Factory Act, Explosive act, Boiler Act, ESI Act, Workman's compensation Act.
5. **Industrial Hygiene**: Occupational Safety Diseases prevention ergonomics. Occupational Diseases, Stress, Fatigue, Health safety and the physical environment. Engineering methods of controlling chemical hazards, safety and the physical environment: Control of industrial nose and protection against it- Code and regulations for worker safety and health.
6. **Case Studies**

**Reference**

1. L M Deshmukh Industrial Safety Management McGraw Hill 2006
- 2 Ray Asfahl C., "Industrial Safety and Health Environment". Fifth Edition, Prentice Hall, 2003
3. Willie Hammer, "Occupational Safety Management and Engineering", Fifth Edition Prentice Hall; Fifth Edition, 2000
4. "Occupational safety manual" – BHEL
5. Safety in industry, N.V.Krishna, Jaico Publishers House
6. Industrial Safety and the Law, John Ridley P.M.C Nair Publishers, Trivandrum, 1998
7. Safety Law for Occupational Health and Safety – John Channing Butterworth Heinemann;