

### Course Content

Category	Title	Code	Credits-4C			Theory Paper
DC (E)-1	Materials Management	IP/IE 701 (A)	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1		

**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

### Course Contents

Category	Title	Code	Credits-4C			Theory Paper
DC(E).-1	Computer Aided engineering and FEM	IP/IE 701(B)	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

**Unit-I Introduction** : Structural analysis, objectives, static, Dynamic and kinematics analyses, Skeletal and continuum structures, Modeling of infinite d.o.f. system into finite d.o.f. system, Basic steps in finite element problem formulation, General applicability of the method.

**Unit-II Element Types and Characteristics** : Discretization of the domain, Basic element shapes, Aspect ratio, Shape functions, Generalized co-ordinates and nodal shape functions; 1D bar and beam elements, 2D rectangular and triangular elements; axis-symmetric elements.

**Unit-III Assembly of Elements and Matrices**: Concept of element assembly, Global and local co-ordinate systems, Band width and its effects, Banded and skyline assembly, Boundary conditions, Solution of simultaneous equations, Gaussian elimination and Choleksy decomposition methods, Numerical integration, One and 2D applications.

**Unit-IV Higher Order and iso-parametric Elements**: One dimensional quadratic and cubic elements, Use of natural co-ordinate system, Area co-ordinate system continuity and convergence requirements, 2D rectangular and triangular requirement.

**Unit-V Static Analysis**: Analysis of trusses and frames, Analysis of machine subassemblies, Use commercial software packages, Advantages and limitations

**Unit-VI Dynamic Analysis**: Hamilton's principle, Derivation of equilibrium, Consistent and lumped mass matrices, Derivation of mass matrices for 1D elements, Determination of natural frequencies and mode shapes, Use of commercial software packages.

### References:

15. Gokhle Nitin; et al; Practical Finite Element Analysis; Finite to Infinite, 686 Budhwar Peth, Pune.
16. Logan DL ; A First Course in Finite element Method; Cengage
17. Krishnamoorthy; Finite Element Analysis, theory and programming; TMH
18. Buchanan; Finite Element Analysis; Schaum series; TMH
19. Seshu P; Textbook of Finite Element Analysis; PHI.
20. Chennakesava RA; Finite Element Methods-Basic Concepts and App; PHI Learning
21. Reddy JN; An introduction to finite element method; TMH
22. Desai Chandrakant S et al; Introduction to finite element Method; CBS Pub
23. Hutton D; Fundamentals of Finite Element Analysis; TMH
24. Zienkiewicz; The finite element Method; TMH
25. Martin and Grahm; Introduction to finite element Analysis (Theory and App.)
26. Rao, S.S., The Finite Element Method in Engineering; Peragamon Press, Oxford.
27. Robert DC., David DM et al, Concepts and Application of Finite Element Analysis; John Wiley.
28. Chandrupatla, T.R. an Belegundu, A.D., Introduction to Finite Elements in Engineering, PHI

### Course Content

Category	Title	Code	Credits-4C			Theory Paper
DC (E)-2	Financial Management	IP/IE 702 (A)	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1		

**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, pro-forma 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

## Course Contents

Category	Title	Code	Credits-4C			Theory Paper
DC(E)-2	MIS, ERP and e-Business	IP/IE 702(D)	L	T	P	Max. Marks-100 Min. Marks-35 Duration: 3 hrs.
			3	1	-	

**UNIT 1 Management Information System (MIS)** definition, Objectives and benefits, MIS as strategic tool, obstacles and challenges for MIS, functional and cross functional systems, hierarchical view of CBIS, structured and unstructured decision, Operation and mgt support, Decision process and MIS, info system components and activities, Value chain and MIS support.

**UNIT 2 System concepts:** types, definition, characteristics, feedback (Pull) and feed-forward (Push) control, system stress and entropy, computer as closed system, law of requisite variety, open and flexible (Adaptive) systems, work system model and comparison with input-process-output model, five views of work system: structure, performance, infrastructure, context and risk and their effect on product performance.

**UNIT 3 Info concepts:** define data, info, knowledge, intelligence and wisdom, Information characteristics and attributes, info measurement and probability, characteristics of human as info processor.

**UNIT 4 Planning and control Concepts:** terminologies, difficulties in planning, system analysis and development plan-purpose and participants, info planning, (SDLC) system development life cycle for in-house and licensed sw, system investigation, analysis of needs, design and implementation phases, training of Operational personnel, evaluation, Control and Maintenance of Information Systems.

**UNIT 5 E-business** components and interrelationship, Evolution of Enterprise Resource Planning (ERP) from MRP, Supply chain management (SCM) and Customer relationship management (CRM), Integrated data model, strategic and operational issues in ERP, Business Process Re-Engineering (BPR), significance and functions, information technology and computer NW support to MIS.

### References

1. Davis and Olson, Management Information Systems, TMH
2. James O' Brian, Management Information Systems, TMH
3. Oz, Management Information Systems, Cengage
4. Alter Stevenson, Information Systems: Foundation of E-Business; (Prentice-Hall,USA)
5. Jayaraman, Business Process Re-Engineering, TMH.
6. Garg. V.K.; ERP, PHI
7. Kelkar SA; Management Information Systems A Concise Study; PHI Learning.
8. Radhakrishnan R and Balasuramanian S; Business Process Reengineering; PHI Learning.
9. Alex Leon ; ERP, TMH
10. Jawadekar WS; MIS- text and cases; TMH
11. Jaiswal M and Mital M; MIS; Oxford higher Edu India

### Course Content

Category	Title	Code	Credits-6C			Theory Paper
DC 17	Welding and Non-Destructive Testing	IP/IE 703	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**UNIT I Arc welding:** Arcing phenomenon, metal transfer in arc welding, arc blow, types of electrode & their coating, electrodes for SMAW/ MIG, TIG, SAW,PAW & their specification.

**Gas welding:** Welding techniques; left ward and right ward welding, filler metals and rods; oxy hydrogen and other fuel gas welding; air acetylene welding.

**UNIT II Special welding process:** Cold pressure welding; diffusion welding, ultra sonic welding explosive welding friction welding and inertia welding; forge welding, electron beam welding; laser beam welding; atomic hydrogen welding; thermit welding, under water welding process, thermal spraying & metal-addition

**UNIT II Weld-ability and Weld-ability testing:** Weld-ability of cast iron, effect of alloying elements in Weld-ability; steel, stainless steel, aluminum & copper welding; welding of plastics.

**Distortion & discontinuities in weld-jobs:** Weld-jobs distortion and its control, various discontinuities in welds, residual stresses in weld-jobs; trouble shooting.

**UNIT IV Non Destructive Testing and inspection of weld-jobs:** Non destructive methods of testing weld-jobs; stages of weld inspection and testing, visual inspection ,leak test; stethoscopes test; X-ray and γ-ray radiography, magnetic particle inspection; liquid(dye) penetrate test; fluorescent penetrate inspection; ultrasonic inspection and Eddy current testing.

**UNIT V Testing:** Pipe, plate, boiler, drum, tank testing. Case-studies weld thermal cycle-residual stresses-distortion-relieving of stresses. **Automation in welding:** Structure analysis; basic operations, robotic welding, types of welding robots.

### References

1. Malhotra; Handbook on Non-destructive Testing of Concrete; CRC Press,
2. Henrique L M; Non Destructive Testing and Evaluation for Mfg ...; Hemisphere Pub NY,
3. Rao PN; Manufacturing Technology Vol 1; TMH
4. Groover MP; Fundamentals of Modern mfg; Wiley India
5. Kaushish JP; Manufacturing Processes; PHI Learning
6. Oswald PF; Mfg Processes and Systems; Wiley India
7. Parmar, R.S; Welding Processes And Technology
8. Srinivasan.N.K.; Welding Technology; Khanna Pub.

### List Of Experiments (Please Expand it):

1. Prepare job of lap and butt joint by electric arc welding
2. Study/ make job on special welding methods like TIG, MIG, laser welding
3. Find welding defects on weld jobs by cutting welded joints
4. Non destructive die penetration testing of weld jobs
5. Experiments on various NDT methods contained in the theory

### Course Contents

Category	Title	Code	Credits-6C			Theory Paper
DC18	Industrial Robotics	IP/IE 704	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**Unit I Introduction:** Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, motion characteristics, resolution, accuracy, repeatability, robot applications.

**Unit II End Effectors and Drive systems:** Drive systems for robots, salient features and comparison, different types of end effectors, design, applications.

**Unit III Sensors:** Sensor evaluation and selection – Piezoelectric sensors – linear position and displacement sensing, revolvers, encoders, velocity measurement, proximity, tactile, compliance and range sensing. Image Processing and object recognition.

**Unit IV Robot Programming:** Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications.

**Unit V Safety and Economy of Robots:** Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots.

#### References:

1. Mittal RK, Nagrath IJ; Robotics and Control; TMH
2. Groover M.P, Weiss M, Nagel, Odrey NG; Industrial Robotics-The Appl...; TMH
3. Groover M.P; CAM and Automation; PHI Learning
4. Spong Mark and Vidyasagar; Robot Modelling and control; Wiley India
5. Yoshikawa ; Foundations of Robotics- analysis and Control; PHI Learning;
6. Murphy ; Introduction to AI Robotics; PHI Learning
7. FU KS, Gonzalez RC, Lee CSG; Robotics –Control, sensing...; TMH
8. Shimon, K; Handbook of Industrial Robots; John Wiley & Sons,.
9. Ghosal Ashitava; Robotics Fundamental concepts and analysis; Oxford
10. Saha S; Introduction to Robotics; TMH
11. Yu Kozyhev; Industrial Robots Handbook; MIR Pub.

#### List Of Experiments (Please Expand it):

1. Study of different types of robots
2. Study of different robot arm motions
3. Study of sensors used in robots
4. Experiments on robot programming
5. Modeling of robots

## Course Content

Category	Title	Code	Credits-6C			Theory Paper
DC 19	Logistics and SCM	IP/IE 705	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**Unit 1 Introduction:** Definition, importance, expenditure and opportunities in SCM; integration of inbound, outbound logistics and manufacturing to SCM, flow of material money and information, difficulties in SCM due to local v/s system wide (global) optimization and uncertainties in demand and transportation; Bull-whip effect; customer value; IT, info-sharing and strategic partnerships;

**Unit 2 Design of SC network:** Plant and warehouse-network configuration; data collection and aggregation; transportation and mileage costs; warehouse capacity, costs and potential locations; service level requirements; variance reduction by pooling demands; cross docking and transshipments distribution

**Unit 3 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 to SCM and e-business.

**Unit 4 Strategic alliance and integration:** 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; issues to be addressed in strategic alliance; use and merit/ demerit of third party (3PL) logistic; push, pull and push-pull based supply chains; push-pull boundary, appropriate strategy on matrix of demand uncertainty and economy of scale; coordination and leadership issues; change of purchasing role and vendor rating, variability from multiple suppliers; supply contracts and revenue sharing;

**Unit 5 Role of IT:** Value and impact of centralized information on Bullwhip effect; effective forecasts; locating products in SC; lead time reduction; dimensions of customer value; relationship and customer satisfaction; strategic pricing; IT infrastructure;; standardization and compatibility; interface devices, communication and databases; performance measurement in supply chain management; Decision Support Systems for SCM

### References:

1. Deshmukh & Mohanty; Essentials of SCM; Jaico Publishing House
2. Levi DS & ES, Kaminsky P; Designing and Managing the Supply nChain; TMH
3. Chopra, Meindl, Kalra; Supply Chain Management; Pearson Education
4. Exploring the Supply Chain by Upendra Kachru, Excel Books
5. Supply Chain Management, by Janat Shah, Pearson Education
6. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
7. Bowersox DJ, Closs DJ, Cooper MB; Supply Chain Logisti Mgt; TMH
8. Burt DN, Dobler DW, StarlingSL; World Class SCM; TMH

### List Of Experiments (Please Expand it):

1. Case studies and problems related to the theory
2. Design of network configurations using computer

#### Course Contents

Category	Title	Code	Credits 4C			Practical
DC 20	Minor Project	IE/IP 706	L	T	P	Max. Marks-50
			0	0	4	Min. Marks-25-

Provision of Minor project is made as preparation phase-I for major project or to take it as an independent small project. For details of project see ME-805- Major project

#### Course Contents

Category	Title	Code	Credits 2C			Practical
DC 21	Industrial Training	IE/IP 707	L	T	P	Max. Marks-30
			0	0	2	Min. Marks-15

### Objective of Industrial Training

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

### Scheme of Studies:

Duration: Minimum 2 weeks in summer break after VI semester, assessment to be done in VII semester

### Scheme of Examination:

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry		Marks Allotted
Attendance and General Discipline		5
Daily diary Maintenance		5
Initiative and participative attitude during training		10
Assessment of training by Industrial Supervisor		10
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Total		30*
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(b) Practical/Oral Examination (Viva-Voce) in Institution		Marks Allotted
1. Training Report		15
2. Seminar and cross questioning (defense)		15
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Total		30
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\* - Marks of various components in industry should be awarded by the I/c of training in Industry but in special circumstances if not awarded by the industry then faculty in charge /T.P.O. will give the marks.

During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the Institute.



## Learning through Industrial Training

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases.
- Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system
- Costing system
- Stores and purchase systems.
- Layout of Computer/EDP/MIS centers.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of work etc.

Students are supposed to acquire the knowledge on above by-

- Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time
- Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- "Hand's on" experience
- Undertaking/assisting project work.
- Solving problems at the work place.
- Presenting a seminar
- Participating in group meeting/discussion.
- Gathering primary and secondary data/information through various sources, storage, retrieval and analysis of the gathered data.
- Assisting official and managers in their working
- Undertaking a short action research work.
- Consulting current technical journals and periodicals in the library.
- Discussion with peers.

## Daily Diary- Industrial Training

Name of the Trainee..... College .....  
Industry / work place ..... Week No.....  
Department /Section ..... Date .....

Dates ..... Brief of observations made, work done, problem/project undertaken,  
discussion held, literature consulted etc.

Signature of Supervisor  
(TPO/Faculty)

Signature of Trainee

Signature of Official in  
charge for Trg. In Industry.

## Supervision of Industrial Training

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above area in the field.

One faculty member or TPO will plan industrial training of students in consultation with training manager of the industry (work place) as per the predefined objectives of training.

Monitoring visits will be made by training and placement officer/faculty in-charge for the group of students, of the college during training.

## Guidance to the faculty / TPO for Planning and implementing the Industrial Training

Keeping in view the need of the contents, the industrial training program, which is spread to minimum 2 weeks duration, has to be designed in consultation with the authorities of the work place; Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.
- Discussing and preparing students for the training for which meetings with the students has to be planned.
- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the program.
- Correspondence with the authorities of the work place.
- Orientation classes for students on how to make the training most beneficial- monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace, ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training.,
- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

## Action plan for planning stages at the Institutional Level

S.No.	Activity	Commencing Week	Finishing week	Remark
1.	Meeting with Principal			
2.	Meeting with colleagues			
3.	Correspondence with work place(Industry concerned)			
4.	Meeting with authorities of work place			
5.	Orientation of students for industry training			
6.	Scrutinizing individual training plan of students.			
7.	Commencement of individual training			
8.	First monitoring of industrial training			
9.	Second monitoring of industrial training			
10.	Finalization of Training report			
11.	Evaluation of performance at industry level			
12.	Evaluation of Industry Program in the Institutions.			