

Pandit Deendayal Petroleum University
School of Technology
Course Structure for B. Tech. Industrial Engineering

SEMESTER VI			B. TECH. INDUSTRIAL ENGINEERING										
Sr. No.	Course Code	Course Name	Teaching Scheme					Exam Scheme					Total Marks
			L	T	P	C	Hrs./Wk.	Theory			Practical		
								MS	ES	IA	LW	LE/Viva	
1	IE 305	Industrial Environment and Safety (Theory)	3	-	-	6	3	30	60	10	-	-	100
2	IE 3XX	Department Elective - 1	3	1	-	7	4	30	60	10	-	-	100
3	IE 306	Procurement and Materials Management	3	-	-	6	3	30	60	10	-	-	100
4	IE 307	Principles of Finance and Costing	3	-	-	6	3	30	60	10	-	-	100
5	IE 308T	Ergonomics, Human Factors & Product Design (Theo	3	-	-	6	3	30	60	10	-	-	100
6	IE 308P	Ergonomics, Human Factors & Product Design (Prac	-	-	2	1	2	-	-	-	25	25	50
7	ME 311T	Production Technology (Theory)	3	-	-	6	3	30	60	10	-	-	100
8	ME 311P	Production Technology (Practical)	-	-	2	1	2	-	-	-	25	25	50
9		Humanities Elective	2	-	-	4	2	30	60	10	-	-	100
		Total	20	1	4	43	25						800

MS = Mid Semester
LW = Laboratory Work

ES = End Semester
LE = Laboratory Exam

IA = Internal Assessment (like quiz, assignments, etc.)

IE 305 INDUSTRIAL ENVIRONMENT AND SAFETY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100
<p>UNIT I 10 Safety Management, concepts, safety committee, safety policy. Accident investigation and reporting, reportable and non-reportable accidents, reporting to statutory authorities, preparation of accident reports. Safety education, training and performance monitoring, safety audits. Accident causation theories. Cost of accidents. Behavior based safety.</p> <p>UNIT II 10 Safety in engineering industry, principles of machine guarding, safety in welding and gas cutting, forming and hot working of metals, safety in inspection and testing. Electrical safety, statutory requirements related to electrical safety, protection systems. Noise related issues, sources of noise, noise control. Biohazards. Personal protective equipment.</p> <p>UNIT III 9 Environment and safety, air pollution, water pollution, solid waste management, hazardous waste management, environmental measurement and control. Hazard analysis, risk analysis and quantification. Use of software. Environment impact assessment, legal provision of EIA, legislative and environmental clearance procedure in India.</p> <p>UNIT IV 9 Regulations related to health, environment and safety, relevant sections of the Factories Act, relevant sections of the Environment Act, other acts and rules. International acts and standards such as OHSAS 18000 and ISO 14000. Planning, implementation and audit for OHSAS 18000 and ISO 14000.</p> <p style="text-align: right;">APPROXIMATE TOTAL 38</p>										
Texts and References										
<ol style="list-style-type: none"> 1. John V. Grimaldi and Rollin H. Simonds, Safety Management, All India Traveler's Bookseller, New Delhi – 1989. 2. Arcadio, P. Sincero and G. A. Sincero, Environmental Engineering – A Design Approach, Prentice Hall of India Pvt Ltd, New Delhi, 2002. 3. G. Masters Introduction to Environmental Engineering and Science, Prentice Hall of India Pvt Ltd, New Delhi, 2003. 4. ISO 9000 to OHSAS 18001, Dr. K.C. Arora, S.K. Kataria and Sons, Delhi. 5. Canter. R. L., Environmental Impact Assessment, McGraw Hill, 1981. 6. John G. Rau and David. C. Wooten (Ed)., Environmental Impact Analysis Hand Book, McGraw Hill Book Company, 1980. 										

IE 306 PROCUREMENT AND MATERIALS MANAGEMENT										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100
<p>UNIT I 7 Introduction, scope and objectives of materials management, systems approach to materials management, relation with other functional areas of organization. Organizing for materials management, basis for forming organizations, conventional and modern approaches to organizing materials management.</p> <p>UNIT II 12 Materials identification, classifying of materials, codification of materials, standardization, simplification and variety reduction of materials. Inventory control techniques, FSN, VED, ABC analyses, working capital management with reference to inventory. Management of stores, location, different types of stores, methods of storing, safety and security of materials, stores equipment, materials handling equipment, factors affecting materials handling. Stores issues and receipts, procedures, forms and policies in stores transactions, stores accounting, stores organization. Management of surplus obsolete and scrap materials, reasons for accumulation of surplus obsolete and scrap materials, methods of disposal, regulations and procedures.</p> <p>UNIT III 12 Responsibilities of Purchase Department, purchase cycle, negotiation and bargaining, purchasing methods. Selection of vendors, vendor relations, vendor rating, norms of vendor rating, CEI methodology, Global sourcing, procurement in Japanese industry. Purchasing procedures and methods, legal aspects, insurance of materials, supply management, sources of supply, out sourcing.</p> <p>UNIT IV 7 Purchasing capital equipment, purchasing vs. leasing, Contract management, e-procurement. Introduction to public procurement, state policies and guidelines. Basic overview of import and export.</p> <p style="text-align: right;">APPROXIMATE TOTAL 38</p>										
Texts and References										
<ol style="list-style-type: none"> Datta, A. K., Materials Management: Procedures, Text and Cases, 2nd edition, PHI Dobbler, B., Purchasing and Supply Management, TMI Gopalakrishnan, P. and Sundaresan M., Materials Management: An Integrated Approach, PHI Leenders Fearon, Purchasing And Materials Management, Universal Book Stall Menon, K. S., Purchasing And Inventory Control, Wheeler Publishers Varma, M. M., Materials Management, Sultan Chand And Sons 										

IE 307 PRINCIPLES OF FINANCE AND COSTING

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100

UNIT I 10

Introduction to cost accounting, relationship between financial accounting and cost accounting, cost concepts and costing methods, overview of cost management accounting, various cost concepts, direct expenses & overheads, unit costing, tools and techniques, job and batch costing, activity based costing.

UNIT II 10

Estimation of effort and cost for various manufacturing processes. Costing methods: operating costing, process costing and joint costing and by-product costing. Management applications: marginal (variable) costing and CVP analysis, decisions involving short-run alternative choices, pricing decisions. Planning, control and decision making: budgeting and budgetary control systems, variance analysis.

UNIT III 10

Understanding the meaning of Financial Management, financial system, time value of money, basics of risks and returns, cost of capital, concepts of time value, compounding and discounting, annuities. Techniques of capital budgeting, NPV, IRR and other methods. Estimation of cash flows, risk analysis in capital budgeting.

UNIT IV 8

Principles of Working Capital Management, Various Approaches, Estimation of Working Capital, Management of Components of Working Capital; Cash, receivables, inventory. Working capital financing, sources of working capital finance.

APPROXIMATE TOTAL 38**Texts and References**

1. Horngren, Datar and Rajan, Cost Accounting: A Managerial Emphasis, 14th edition, Prentice Hall
2. Paresh Shah, Management Accounting, Oxford University Press.
3. Kesavan, R., Elanchezian, C., and Ramnath B., Process Planning and Cost Estimation, 2nd edition, New Age International
4. Thuesen, G. J., and Fabrycky, W. J., Engineering Economy, 9th edition, Prentice Hall of India
5. Park, C., Contemporary Engineering Economics, 3rd edition, Prentice Hall of India

IE 302T WORK DESIGN AND MEASUREMENT										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100
UNIT I										12
Introduction to Work Study, Work of F.W. Taylor; Frank and Lillian Gilbreth and others; definition of productivity; means of increasing productivity; definition of work study; productivity and work study; human factors in the application of work study. Motion Study, definition, aims; procedure for method study; selection of jobs; recording techniques; micro-motion study; Therbligs; cyclograph and chronocyclograph; principles of motion economy; design of work place layout; analysis in the form of a chart; operation chart; flow process chart; flow diagram; string diagram; man-machine chart; two hand chart; simo chart.										
UNIT II										12
Introduction to work measurement, definition, uses, procedure; time study equipment; selection of operator, performance rating, allowances, synthesis, standard data, production interruption study, analytical estimation, work sampling, statistical concepts, confidence limits, number of cycles to be studied; determination of standard time; PMTS, MTM, WFS.										
UNIT III										8
Introduction to job evaluation; objectives of job evaluation; job analysis, job description, methods of job evaluation like factor comparison, point system, etc. Job design, psychological aspects of job design. Introduction to ergonomics in the work environment. Wages and incentives, characteristics of a good wage/incentive system, methods of wage payment. Halsey's premium plan, piece rate system.										
Unit IV										7
Value Engineering, concept of value; product life cycle, value engineering approaches, job plan, value tests. Introduction to plant layout, importance and relevance of plant layout, various types of plant layout, process layout, product layout, cellular layout, fixed layout; layout algorithms. Layout of service facilities. Types and methods of cost estimation, cost elements, allocation of overheads, break-even point.										
APPROXIMATE TOTAL										39
Texts and References										
6. Introduction to Work Study, ILO, Universal Publishing Corporation, Bombay,1986.										
7. Motion and Time Study, Mundel, Prentice Hall of India, 1995.										
8. Motion and Time Study; Ralph M. Barnes, John Wiley and Sons, 1990.										
9. Techniques of Value Engineering and Analysis, Miles; L. D., McGraw Hill second Edition, 1972.										
10. Work Study by R. C. Patel										

IE 302P WORK DESIGN AND MEASUREMENT LABORATORY

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	25	25	50

List of Experiments

1. Preparation of flow diagram
2. Preparation of man-machine chart
3. Preparation of LH-Rh chart
4. Micromotion study/Therbligs
5. Time study
6. Work sampling

IE 301 PRODUCTION AND OPERATIONS MANAGEMENT										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100
<p>UNIT I 10 Introduction to Operations Management, operations strategy. Forecasting, time series methods of forecasting, causal methods of forecasting, measures of error, qualitative forecasting. Inventory management, inventory costs, the basic EOQ model, EOQ with gradual replenishment, price break models, reorder point, safety stock, the Newsboy problem.</p> <p>UNIT II 10 Material Requirements Planning (MRP), components of MRP, MRP logic, lot sizing in MRP systems (LFL, EOQ, POQ, LTC, LUC, etc.), introduction to ERP systems. Operations scheduling, loading, sequencing methods (SPT, EDD, Moore's method, Johnson's method, etc.). Introduction to project management, Gantt charts, CPM, AOA/AON networks, concept of slack, the critical path, probabilistic time estimates, project crashing.</p> <p>UNIT III 9 Waiting line models, various types of queues (M/M/1, M/D/1, M/G/1, M/M/S, etc.), measures of queue performance, management of waiting lines. Introduction to facility planning, the facility location problem, factors influencing facility location, facility location models, process layouts, layout methods, computerized algorithms for facility layout, product layouts, fixed position layouts, cellular layouts, layout of service facilities.</p> <p>UNIT IV 9 Introduction to quality management, cost of quality, quality management systems, concepts of TQM, quality tools, process capability, concept of six sigma, quality tools, control charts (\bar{X} and R charts, p-chart, np-chart, c chart), acceptance sampling, AQL, LTPD, OC curves. Lean manufacturing, JIT, the Toyota Production System, waste elimination, push vs. pull systems, use of kanban.</p> <p style="text-align: right;">APPROXIMATE TOTAL 38</p>										
Texts and References										
<ol style="list-style-type: none"> Operations and Supply Management, Chase, R. B., Ravi Shankar, Jacobs, F. R. and Aquilano, N. J., 12th edition, Tata McGraw Hill. Modern Production and Operations Management, Buffa, E. S. and Sarin, R., 8th edition, John Wiley. Operations Management Along the Supply Chain, Russell, R. S. and Taylor, B. W., 6th edition, Wiley India. Operations Management, Heizer J., Render, B. and Rajashekhar, J., 9th edition, Pearson Education. 										

ME 311T PRODUCTION TECHNOLOGY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100
UNIT I					08					
<p>Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects chip breakers. Mechanics of orthogonal cutting –Merchant’s Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials</p> <p>Introduction – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.</p>										
UNIT II					05					
<p>Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.</p> <p>Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, And mechanics of metal removal, MRR, application and limitations.</p>										
UNIT III					10					
<p>Electrochemical Process: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.</p> <p>Thermal metal removal processes: General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.</p>										
UNIT IV					14					
<p>Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.</p> <p>Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.</p> <p>Chemical machining-principle- maskants –etchants- applications. Magnetic abrasive finishing, Abrasive flow finishing, Electro-stream drilling, Shaped tube electrolytic machining.</p>										
Approximate Total : 39 Hrs										
References & Text Books:										
<ol style="list-style-type: none"> 1. VK Jain, Advanced machining processes, Allied publishers. 1. Pandey P.C. and Shah H.S., Modern Machining Process, Tata McGraw Hill. 2. Bhattacharya A, New Technology, The Institution of Engineers, India 										

ME 311P PRODUCTION TECHNOLOGY

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

List of Experiments:

1. Initial experiments with conventional machining processes
2. Hands on experiment with CNC lath machine
3. Hands on experiment with CNC milling machine
4. Visit to Water jet machining workshop.
5. Visit to advance machining workshop of INDO-GERMAN TOOL, CIPET,etc.

IE 309 OPERATIONS RESEARCH – II (DE)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	7	4	30	60	10	--	--	100
<p>UNIT I 12 Network models, shortest path problems, maximum flow problems, minimum cost network flow problems, minimum spanning tree problems, the network simplex method. Application to CPM/PERT. Non-linear programming, convex and concave functions, NLPs with one variable, golden section search, unconstrained optimization, method of steepest ascent, quadratic programming, separable programming.</p> <p>UNIT II 8 Introduction to Dynamic Programming, various types of DP problems, formulation, the Wagner-Whitin algorithm and the Silver-Meal heuristic. Introduction to probabilistic DP.</p> <p>UNIT III 9 Stochastic processes, Markov Chains, classification of states, Chapman-Kolmogorov equations, first passage times, applications of Markov Chains. Queueing theory, Little’s law, various types of queueing systems, finite source models.</p> <p>UNIT IV 9 Decision making under uncertainty, decision criteria, utility theory, decision trees, decision making with multiple objectives, the Analytic Hierarchy Process. Introduction to Monte-Carlo simulation. Use of modeling software in Operations Research.</p> <p style="text-align: right;">APPROXIMATE TOTAL 38</p>										
Texts and References										
<ol style="list-style-type: none"> 1. Winston, W., Operations Research: Applications and Algorithms, Pearson 2. Hillier and Lieberman, Introduction to Operations Research, Tata McGraw-Hill 3. Taha, H., Operations Research: An Introduction, Pearson 4. Render, Stair, Hanna and Badri, Quantitative Analysis for Management, Pearson 										

IE 413 INFORMATION SYSTEMS										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100
<p>UNIT I 10 Concept of information, role of information systems in enterprise, technical and behavioral approach to information systems, sociotechnical systems. Types of information systems, transaction processing systems, business intelligence systems, enterprise applications, systems for collaboration and teamwork, etc.</p> <p>UNIT II 10 Organizational impact of information systems, organizational resistance to change, information systems for competitive advantage, systems analysis. Ethical and social issues in information systems, challenges to privacy, health issues related to information systems: RSI, CVS, technostress.</p> <p>UNIT III 10 Information systems infrastructure, evolution, contemporary hardware and software platforms, SOA, open source software, databases and information management, communication technology and networks.</p> <p>UNIT IV 8 Security in information systems, vulnerabilities and risk assessment, frameworks for security analysis, business continuity planning and disaster recovery. Technologies for protecting information resources. Auditing of information systems.</p> <p style="text-align: right;">APPROXIMATE TOTAL 38</p>										
Texts and References										
<ol style="list-style-type: none"> 1. Laudon, K. and Laudon, P., Management Information Systems: Managing the Digital Firm, 12th edition, Pearson. 2. O'Brien, J., Management Information Systems – Managing Information Technology in the Business Enterprise, 6th edition, Tata McGraw Hill 3. Jawadekar, W. S., Management Information Systems, Tata McGraw Hill 										