AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

REGULATIONS - 2009

CURRICULUM AND SYLLABUS I SEMESTER

M.E. – INDUSTRIAL ENGINEERING

SEMESTER – I

Course code	Course Title	L	T	P	C
THEORY					
MA9317	Probability and Statistics	3	0	0	3
IE 9311	Production and Operations Management	3	0	0	3
IE 9312	Operations Research	3	0	0	3
IE 9313	Human Factors in Engineering and Design	3	0	0	3
IE 9314	Logistics and Supply Chain Management	3	0	0	3
IE 9315	Managerial Accounting and Finance	3	0	0	3
PRACTICALS					
IE 9316	Industrial Engineering Laboratory I	0	0	3	2
IE 9317	Seminar I	0	0	2	1
	TOTAL CREDITS				**21**

MA 9317   PROBABILITY AND STATISTICS   **L T P C**
                                                                      3 0 0 3

UNIT I   PROBABILITY AND RANDOM VARIABLE   9

Probability – Random variables – Moments – Moment generating function – Standard distributions – Functions of random variables – Two-dimensional R.Vs – Correlation and Regression.

UNIT II   ESTIMATION THEORY   9

Principle of least squares – Regression – Multiple and Partial correlations – Estimation of Parameters – Maximum likelihood estimates – Method of moments.

UNIT III   TESTING OF HYPOTHESIS   9

Sampling distributions – Test based on Normal, t-distribution, chi-square, and F-distributions – Analysis of variance – One-way and two way classifications.

UNIT VI   DESIGN OF EXPERIMENTS   9

Completely Randomized Design – Randomized Block Design – Latin Square Design – 2 Factorial Design.

UNIT V   TIME SERIES   9

Characteristics and Representation – Moving averages – Exponential smoothing – Auto Regressive Processes.

                                                      TOTAL: 60 PERIODS

REFERENCES:

1. Freund John, E and Miller, Irvin, "Probability and Statistics for Engineering", 5th Edition, Prentice Hall, 1994.
2. Jay, L.Devore, "Probability and Statistics for Engineering and Sciences", Brooks Cole Publishing Company, Monterey, California, 1982.
3. Montgomery D.C and Johnson, L.A, "Forecasting and Time series", McGraw Hill.
4. Anderson, O.D, "Time series Analysis: Theory and Practice", I.North-Holland, Amsterdam, 1982.
5. Gupta, S.C and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi, 1999.

IE 9311   **PRODUCTION AND OPERATIONS MANAGEMENT**   **L T P C**
                                                              3 0 0 3

UNIT I   INTRODUCTION   9
Scope of operations management, strategy and productivity, productivity tools. Forecasting - introduction, measures of forecast. Accuracy, forecasting methods - time series smoothing - regression models - exponential smoothing - seasonal forecasting - cyclic forecasting. Introduction to auto-regression models for forecasting.

UNIT II   LONG TERM PLANNING   9
 Product design. Capacity planning. Facility location – factors, location evaluation methods. Process selection and facility layout – Types of layouts for operations and production. Arrangement of facilities within departments. Flexible manufacturing system - concepts - advantages and limitation.

UNIT III   AGGREGATE PLANNING AND MRP   9
Aggregate planning – approaches, graphical, empirical, and optimization. Development of a master production schedule, materials requirement planning (MRP-I), manufacturing resource planning (MRP -II), and ERP.

UNIT IV   INVENTORY ANALYSIS AND CONTROL   9
 Definitions - ABC inventory system - EOQ models for purchased parts - inventory order policies - EMQ models for manufactured parts - lot sizing techniques.   Inventory models under uncertainty.

UNIT V   PRODUCTION PLANNING AND CONTROL   9
Objectives in scheduling - major steps involved - information system linkages in production planning and control - production control in repetitive, batch and job shop manufacturing environment. Scheduling with resource constraints – allocation of units for a single resource - allocation of multiple resources - resource balancing. Line balancing - Helgeson Brine approach - Region approach.   Stochastic mixed - product line balancing. Introduction to JIT.

TOTAL : 45 PERIODS

REFERENCES :
1.   Richard B Chase, Robert Jacobs F and Nicholas J Aquilano, "Operations Management for Competitive Advantage", McGraw-Hill/Irwin; Tenth Edition, 2003.
2.   Gaither N, "Production and Operations Management: Problems Solving And Decision", Dryden Press; Fourth Edition, 1990.
3.   Dilworth B James, "Operations Management Design, Planning and Control for Manufacturing and Services", McGraw Hill, Inc, New Delhi, 1992.

REFERENCES :
1.   Bedworth D D, "Integrated Production Control Systems Management, Analysis, Design", John Wiley and Sons, New York, 1982.
2.   Vollman T E, "Manufacturing Planning and Control Systems", Galgotia Publication (P) Ltd., New Delhi, 1998.
3.   Buffa E S, "Modern Production/Operations Management", Wiley; Eighth Edition,January

IE 9312   **OPERATIONS RESEARCH**   **L T P C**
                                                                          3 0 0 3

UNIT I   INTRODUCTION TO LINEAR PROGRAMMING   9
Concepts and development of OR, assumptions, formulation, graphical method, Simplex Algorithm.

UNIT II   ADVANCED TOPICS IN LINEAR PROGRAMMING   9
Revised simplex method, duality theory, sensitivity analysis, Introduction to Integer Programming.

UNIT III   NET WORK METHODS   9
Transportation, assignment, maximum flow, shortest route, spanning tree problems, PERT/CPM.

UNIT IV   DYNAMIC PROGRAMMING   9
Concepts, formulation, recursive approach, computation procedure.

UNIT V   WAITING LINE MODELS   9
Queuing characteristics and terminology, single server and parallel server models, Introduction to Markov Process .

                                                               TOTAL : 45 PERIODS

REFERENCES :
1.   Hamdy A.Taha, "Operations Research: an introduction", 4th edition, Mc Millan Co., 2003.
2.   Don T.Phillips, A.Ravindran & James Solberg, Operations Research: Principles and practice, John Wiley & Sons, 1992.
3.   Guisseppi A.Forgionne, Quantitative decision making, Wordsworth Publishing Co., 1986.
4.   Schaum's Outline Series Operations Research II Edition, Richard Broson, Govindasamy Naachimuthu, 2000.
5.   Hillier and Lieberman, " Introduction to Operations Research", McGraw Hill International Edition, Seventh Edition, 2001.

IE9313 **HUMAN FACTORS IN ENGINEERING AND DESIGN** **L T P C**
                                                          3 0 0 3

UNIT I   INTRODUCTION   9
Definition, human technological system, multidisciplinary engineering approach, human–machine system, manual, mechanical, automated system, human system reliability, conceptual design, advanced development, detailed design and development, human system modeling.

UNIT II   INFORMATION INPUT   9
Input and processing, text, graphics, symbols, codes, visual display of dynamic information, auditory, tactual, olfactory displays, speech communications.

UNIT III   HUMAN OUTPUT AND CONTROL   9
Physical work, manual material handling, motor skill, human control of systems, controls and data entry devices, hand tools and devices.

UNIT IV   WORKPLACE DESIGN   9
Applied anthropometry, workspace design and seating, arrangement of components within a physical space, interpersonal aspects of work place design, design of repetitive task, design of manual handling task, work capacity, stress, fatigue.

UNIT V   BIOMECHANICS   AND ENVIRONMENTAL CONDITIONS   9

Biostatic mechanics, statics of rigid bodies, upper extremity of hand, lower extremity and foot, bending, lifting and carrying, biodynamic mechanics, human body kinematics, kinetics, impact and collision.

Illumination, climate, noise, motion, sound, vibration.

TOTAL : 45 PERIODS

TEXT BOOKS:
1.   Chandler Allen Phillips, "Human Factors Engineering", John Wiley and Sons, New York, 2000.

REFERENCES :
1. Mark S Sanders, "Human Factors in Engineering and Design", McGraw Hill, New York, 1993.
2. Bridger R S, "Introduction to Ergonomics", Taylor and Francis, London, 2003.

IE9314   **LOGISTICS AND SUPPLY CHAIN MANAGEMENT**   **L T P C**
                                                                       3 0 0 3

UNIT I   INTRODUCTION   5
Definition, decision phases in a supply chain, objectives of SCM, examples of supply chains, supply chain drivers, supply chain integration, supply chain performance measures.

UNIT II   NETWORK DESIGN IN SUPPLY CHAIN   10
Role of distribution in supply chain – distribution network design – factors influencing distribution network design, distribution networks in practice – network design in the supply chain – factors influencing the network design, framework for network design, models for facility location and capacity allocation – Impact of uncertainty on network design.

UNIT III   INVENTORY MANAGEMENT IN SUPPLY CHAIN   10
Cycle inventory – economies of scale to exploit fixed costs, quantity discounts, example problems – multi-echelon inventory – safety inventory in supply chain – safety level estimation, supply uncertainty, data aggregation, replenishment policies, managing safety inventory in practice – product availability – optimal level, affecting factors, supply chain contracts, examples. Push strategy, pull strategy-Kanban replenishment systems, types, implementation, push-pull strategy.

UNIT IV   STRATEGIC ALLIANCES ,CUSTOMER VALUE AND GLOBAL SUPPLY
                     CHAINS   10
Framework for strategic alliance - 3PL and 4PL – retailer-supplier partnerships – distribution integration – procurement and outsourcing –benefits, E-procurement – design for logistics – supplier integration into new product development – mass customization.
Customer value – dimensions, strategic pricing, measures, IT and customer value – global supply chain – introduction, driving factors, risks and advantages, issues, regional differences in logistics.

UNIT V   INFORMATION TECHNOLOGY IN SUPPLY CHAIN   10
Goals – standardization – infrastructure – interface devices, communications, databases, system architecture – system components – integrating the supply chain information technology - DSS for supply chain management.
Value of information – Bullwhip effect, information and supply chain technology – customer relationship management, supplier relationship management.

                                                            TOTAL : 45 PERIODS
TEXT BOOKS :
1.   Simchi – Levi Davi, Kaminsky Philip and Simchi-Levi Edith, "Designing and
       Managing the Supply Chain", Tata McGraw –Hill Publishing Company Ltd, New
       Delhi, 2003.
2.   Chopra S and Meindl P, "Supply Chain Management: Strategy, Planning, and
       Operation", Second edition, Prentice Hall India Pvt. Ltd, New Delhi, 2005.

REFERENCES :
1.   Robert B Handfield, And Ernest L Nichols, "Introduction to Supply Chain
       Management", Prentice Hall, Inc, New Delhi, 1999.
 2.   Sahay B S, "Supply Chain Management", Macmillan Company, 2000

3. David Brunt, And David Taylor, "Manufacturing Operations And Supply Chain Management : The Lean Approach", Vikas Publishing House , New Delhi, 2001
4. Hartmud Stadler, And Christoph Kilger, "Supply Chain Management And Advanced Planning: Concepts, Models, Software", Springer-Verlag, 2000
5. David F Ross, "Introduction To E-Supply Chain Management", CRC Press, 2003.

IE 9315   **MANAGERIAL ACCOUNTING AND FINANCE**   **L T P C**
                                                                         3 0 0 3

UNIT I   FINANCIAL MANAGEMENT   **9**
Evolution, scope, objectives, functions, environment of corporate finance, Indian Financial system, Reserve Bank of India, Financial institutions, Financial markets, Merchant Banking Financial Services.

Long term - Retained earnings, equity, debenture, term loans, deferred credit, leasing, hire purchase; Short term - Accruals, trade-credit, short term bank finance, public deposit, commercial paper; Cost of capital, Leverage

UNIT III   FINANCIAL STATEMENTS AND ANALYSIS: **9**
Double entry book keeping, journal, subsidiary books, bank reconciliation statement, ledger, trialbalance, trading, profit and loss account, balance sheet; Financial statement analysis, types of financial ratios - liquidity, leverage, profitability, valuation ratios, time series analysis, common size analysis, Du-pont analysis.

UNIT III   COST ACCOUNTING AND CONTROL   **9**
Budget - meaning, purpose, types of budgets- sales, production, purchasing, labou, cash; Flexible budgets.

Nature - Historical and future costs; Cost classification - labour, material, overhead;, cost ladder, cost allocation, overhead absorption methods - DL, DM, number of pieces, LHR, MHR, Activity Based Costing; Accounting for service department expenses; Variance analysis for cost control - labour, material, overhead, variances, various types, illustrative problems.

UNIT IV   WORKING CAPITAL MANAGEMENT   **9**
Overall considerations, influencing factors, working capital policy; Operating cycle analysis - procedure, problems; Cash management; Credit management - terms, credit-policy, credit-evaluation, control of accounts, receivable; Inventory Management - need, order quantity/point, pricing of raw material and valuation, monitoring and control of inventories.

UNIT V CAPITAL STRUCTURE AND BUDGETING   9

Net income approach, Net operating income approach, Traditional position, Modigliani and Miller position; Planning the capital structure, EBIT - EPS analysis, ROI – ROE analysis, Assessment of dept capacity;

Process - cost/benefits, Investment appraisal criteria, time value of money, net present value, internal rate of return, profitability index, pay-back period, accounting rate of return, cash flows

TOTAL: 45 PERIODS

TEXT BOOKS :
1. Prasanna Chandra, "Fundamentals of Financial Management", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

2. Pandey I M "Management Accounitng", Vikas Publishing House, 2000.

REFERENCES :

1. Pandey I M, "Financial Management ", Tata McGraw Hill, 2003.

2. Van Horne, "Financial Management", McGraw Hill, 2002.

3. Ramachandra Aryasri A, Ramana Murthy V V, "Engineering Economics and Financial Management", Tata McGraw Hill, New Delhi, 2004.

IE 9316   **INDUSTRIAL ENGINEERING LABORATORY- I**   **L T P C**
                                                                     0 0 3 2

1. Solving linear programming using MS Excel and Optimization Package (TORA /LINDO)

2. Solving Transportation and Assignment problem using Optimization Package (TORA /LINDO)

3. Solving Maximal flow and Minimal spanning tree problem using Optimization Package (TORA /LINDO)

4. Solving PERT and CPM using Optimization Package (TORA /LINDO)

5. Forecasting using MS Excel

6. Capacity planning using MS Excel

7. Aggregate planning using MS Excel

8. Master production schedule using MS Excel

9. Materials requirement planning for a typical industry using MS Excel

10. Solving Inventory Control problems using MS Excel

TOTAL: 45 PERIODS