TEACHING SCHEDULE & STUDY SCHEME

M. TECH. PROGRAMME

(Industrial Engineering)

PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

August, 2004

**DETAILED SYLLABUS AND OTHER CONDITIONS FOR THE
PROPOSED COURSE
M.TECH. INDUSTRIAL ENGINEERING**

Schedule of Teaching			**Schedule of Examination**				
Lecture	Tutorials (per week)	Total	Time (Hrs.)	Theory Marks	Sessional Marks	Viva	Total
4	0	4 All theory subjects	3	100	50		150
		Project			50	50	100
		Seminar			100		100
		Dissertation		Satisfactory/not Satisfactory			

SEMESTER-I

IE-501	Quantitative Methods and Operations Research
IE-502	Research Methodology
IE-503	Operations Management
IE-504	Simulation of Industrial Systems
IE-505	Methods Engineering and Ergonomics
IE-506	lab-I

SEMESTER-II

IE-507	Supply Chain Management
IE-508	Production and Inventory Control
IE-509	Industrial Psychology
IE-	Elective-I
IE-	Elective-II
IE-518	lab-II

SEMESTER-III

IE-	Elective-III
IE-	Elective-IV
IE-580	Project
IE-590	Seminar

SEMESTER-IV

IE-500	Dissertation

LIST OF ELECTIVES

ELECTIVE-I

IE-510	Materials Management
IE-511	Facilities Planning & Design
IE-512	System Analysis and Design
IE-513	Organization Theory and Behaviour

ELECTIVE-II

IE-514	Maintenance & Reliability Engineering
IE-515	Advance Manufacturing Processes
IE-516	Industrial Economics and Accounting
IE-517	Management Information System

ELECTIVE-III

IE-519	Industrial Automation
IE-520	Business Policy and Strategies
IE-521	Value Engineering
IE-522	Quality Assurance

ELECTIVE-IV

IE-523	Product Design & Development
IE-524	Industrial Packaging
IE-525	Project Appraisal and Management
IE-526	Entrepreneurship
IE-527	Safety Engineering

IE 501:QUANTITAVIE METHODS AND OPERATIONS RESEARCH

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Role of quantitative methods in decision making. Probability and decision making, decision making under uncertainty, the value of additional information, Bay's theorem. Probability models and decision making. Sample survey methods. Methods of measuring and forecasting business changes, index numbers, time series analysis. Markov Analysis.

Background of Operations Research, classification of problems in operations research, phases of operations research study.

Linear programming, formulation of mathematical models, solution of linear programming problems involving design of product mix, resource allocation, transportation and assignment by graphical, simplex and dual simplex methods, Duality theorem and applications, use of computer to solve linear programming problems.

Dynamic programming, principles of optimality, characteristics of dynamic programming problem, deterministic programming models for solution of investment problem, allocation problem, production scheduling and equipment replacement problem, probabilistic dynamic programming. Games theory, mini max - minimum pure strategies, mixed strategies and expected pay off, solution of 2x2, 2xn, mx2 games, Brown's algorithm.

Queuing theory notation and assumptions, Poisson's queuing models, non-Poisson queuing models, queues in series, queuing decision models, Application to scheduling and maintenance problems.

Reference Books:

Quantitative Techniques in Management	Vohra, N.D	Tata McGraw Hill	1995
Principles of Operations Research	Wagner H.M	Prentice Hall	1982
Operations Research	Hira D.S & Gupta P.K	S. Chand & Co.	1995
Operations Research	Taha, H.A	Macmillan Pub. Co.	1972
Quantitative Methods and	Ahuja, K.K	Kalyani Publisher	1990
Operations Research for Business and Economics	Gopikuttan, G.	Himalya Publishers	1994

IE 502: RESEARCH METHODOLOGY

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Nature and objectives of research.

Methods of Research: historical, descriptive and experimental

Alternative approaches to the study of the research problem and problem formulation. Formulation of hypotheses, Feasibility, prepration and presentation of research proposal

Introduction to statistical analysis :   Probability and probability distributions; binomial, Poisson, exponential and normal distributions and their applications.

Sampling: Primary and secondary data, their collection and validation, methods of sampling: Simple random sampling, stratified random sampling and systematic sampling, Attitude Measurement land Scales: Issues, Scaling of attitude, deterministic attitudes, measurement models, summative models, multidimensional scaling.

Regression and correlation analysis. Tests of significance based on normal., t and chi-square distributions. Analysis of variance.

Basic Principles of design of experiments, completely randomized and randomized block designs.

Edition, tabulation & testing of hypotheses, interpolation of results, presentation, styles for figures, tables, text, quoting of reference and bibliography. Use of software for statistical analysis like SPSS, Mini Tab or MAT Lab, Report writing, preparation of thesis, use of software like MS Office.

The course will include extensive use of software, reporting writing and seminars in tutorial class.

Recommended Books
1. C.R Kothari, Research Methodology, Wishwa Prakashan
2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi
3. Fisher, Design of Experiments, Hafner
4. Sadhu Singh, Research Methodology in Social Sciences, Himalya Publishers

5. Stoufferetal, Measurement & Prediction, Wiley, N.York
6. J.W Bames, Statistical Analysis for Engineers & Scientists, McGraw Hill, N.York
7. Donald Cooper, Business Research Methods, Tata McGraw Hill, N.Delhi

IE 503: OPERATIONS MANAGEMENT

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Production functions, work and job design, facilities planning, product and process selection, facilities location, facilities layout and materials handling, capacity planning, production planning and control for different types of manufacturing systems, planning and control of projects, maintenance management, value engineering, quality assurance and quality circles.

Purchase system and purchase principles, inventory management, stores management, standardization, codification and variety, waste management.

Reference Books:

Production and Operation Management	Chunawala	Patel Himalya Publishers	1995
Production and Materials Management	Bhagde, S.D	U.S.G Publishers	1995
Production and Inventory Control	Plossl, G.W & Wight, O.W	Prentice Hall	1967

IE 504: SIMULATION OF INDUSTRIAL SYSTEMS

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

1. Introduction and overview, concept of system, system environment, elements of system, system modeling, types of models, Monte Carlo method, system simulation – a management laboratory, advantages & limitations of system simulation, continuous and discrete system.
2. Simulation of continuous system: Characteristics of a continuous system, comparison of numerical integration with continuous simulation system. Simulation of an integration formation.
3. Simulation of discrete system: Time flow mechanisms, Discrete and continuous probability density functions. Generation of random numbers, testing of random numbers for randomness and for auto correlation, generation of random variates for discrete distribution, generation of random variates for continuous probability distributions-binomial,
4. Simulation of queuing system: Concept of queuing theory, characteristics of queues, stationary and time dependent queues, queue discipline, time series analysis, measure of system performance, Kendal's notation, auto covariance and auto correlation function, auto correlation effects in queuing system, simulation of single server queues, multi server queues, queues involving complex arrivals and service times with blanking and reneging.
5. Simulation of inventory systems: Rudiments of inventory theory, MRP, in-process inventory. Necessity of simulation in inventory problems, forecasting and regression analysis, forecasting through simulation, generation of Poisson and Erlang variates, simulation of complex inventory situations.
6. Design of Simulation experiments: Length of run, elimination of initial bias, Finance Committee Variance, Variance reduction techniques, stratified sampling, antipathetic sampling, common random numbers, time series analysis, spectral analysis, model validation, optimization procedures, search methods, single variable deterministic case search, single variable non-deterministic case search, regenerative techniques.
7. Simulation of PERT: Simulation of – maintenance and replacement problems, capacity planning, production systems, reliability problems, computer time sharing problem, the elevator system.
8. Simulation Languages: Continuous and discrete simulation languages, block structures continuous languages, special purpose simulation languages,

SIMSCRIPT, GPSS SIMULA importance and limitations of special purpose languages.

Reference Books:

Simulation and Modeling	Loffict	Tata Mcgraw Hill
System Simulation with Digital Computer	Deo Narshing	Prantice Hall
System Simulation	Hira, D.S	S.Chand & Co.
Computer Simulation and Modeling	Meeiamkavil	John Willey
System Simulation	Gerden	Prentice Hall

IE 505: METHODS ENGINEERING AND EROGONOMICS

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks 100
Time Allowed 3 Hrs.

Introduction to Industrial Engineering and productivity, measurement of productivity. Introduction to work study, methods study principles and motion economy, design cycle, filming techniques and micro motion analysis, recording techniques, introduction to work measurement, time study, performance allowances, work sampling, predetermined motion systems, job evaluation and merit ration, wage incentive plans, methods time measurement.

Introduction to ergonomics, man/machine/environment systems concept, development of ergonomics.

Design approach: A new design, modification of existing design, assessment of a design, limitations of man & machine with respect to each other, Posture – standing at work, seated at work, work station heights and seat geometry. Human anthropometry and its use in work place layout.

Controls: Hand controls and foot controls, location of controls and work place envelope, recommendation about hand and foot push buttons, rotary selector switches, hand wheels, cranks, levers etc. instruments and displays.

Work Load: Static and dynamic muscular load, human motor activity, metabolism, physical work load, repetitive and inspection work, measurement of physical work load, mental work load and its measurement, work duration and work pauses, principles of motion economy.

Climates: (a) Heat Humidity – Body heat balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance.

(b) Vibrations: Technology, response of body to low frequency vibrations, vibrations and discomfort, effect on health of worker, high frequency vibrations, effect of high frequency vibrations, methods of reducing vibrations.

(c) Noise: Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent threshold shift, effect of noise on performance, reduction of noise, personal noise protection.

Reference Books:

Methods Engineering Study	Krick, E.V		
Work Study and Ergonomics	Shan, H.S	Dhanpat Rai & Sons	1992
Introduction to Ergonomics	Bridger	Tata McGraw Hill	1995
Work Study	Khanna,O.P	Dhanpat Rai & Sons	1995
Sound, Noise and Vibration Control	Lyle, F. Yerges	Van Nostrand	1978

IE--506   Lab-I

Max. Marks: 100
Time Allowed: 2hrs

One lab /field/industrial oriented project /problem will be allocated to each student related to the subjects related to the subjects taught in 1st semester.

IE 507: SUPPLY CHAIN MANAGEMENT

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks 100
Time Allowed 3 Hrs.

Introduction: Objectives of supply chain Management, key components of supply chain i.e. sourcing, distribution strategy, customer service strategy; supply chain Management as Integrated logistics, generic activities, architecture of supply chain, future potential of supply chain Management.

Corporate Profitability: Link to supply chain, evaluation of SCM strategies, customer focus in SCM, inventory and logistic Management, vendor Management, just-in-time (JIT).

Quality Management: Inherent link to SCM: Suppliers development, distribution channel, re-engineering of supply chain, IT – enabled supply chain: Electronic data interchange, enterprise resource planning, implementation of IT, Scope of emerging distributed cooperative tele manufacturing over internet.

Organizational Issues: Application of knowledge Management for effectiveness SCM, social interactions and linking of functional units in a supply chain, Combined core competency of SC : Global sourcing, technology and tools – essential enablers, framework for managing a knowledge intensive supply chian.

Recent Trends in SCM: Tierisation of supplies, Reverse logistics, JIT II, Milk Round System (MRS), bar coding, Hub and Spoke Concept and other latest concepts.

Recommended Books:

1. Chopra, Supply Chain Management, Pearson Education Asia, New Delhi
2. Christopher, Logistics and Supply Chain Management, 2/E, Pearson Education Asia, New Delhi
3. Taylor & Brunt, Manufacturing Operations and Supply Chain Management (The Lean Approach), Business Press Thomson Learning N.Youk.
4. Arjan J. Van Weele, Purchasing and Supply Chain Management (Analysis Planning and Practice), 2/Engineering, Business Press, Thomson Learning N.Youk.
5. Donalad Bowersox, Logistic Management - The Integrated Supply Chain process, McGraw Hill, N.York

IE 508: PRODUCTION AND INVENTORY CONTROL

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Production systems, Types & Characteristic features,   analysis of production system: Objective approaches, Demand forecasting, horizons, techniques and applications: production planning, capacity planning, aggregate planning, master production scheduling, MPR, MRP II, concept of ERP and supply chain management; production control, functions information requirements, modern developments in Production and operations management, inventory control, deterministic and stochastic models, relationship with production control, computer application in Production and Inventory Control.

Recommended Books

1. Krejewski, Operations Management, Pearson Education Asia, New Delhi
2. Chase, Aquilano & Jacob, Production/Operations Management, Tata McGraw Hill, New Delhi
3. Martinich, Operations Management, John Wiley & Sons, New York
4. Simuel Eilon, Production and Planning & Control, Wiley. New York
5. Steven Nahimas, Production & Operations Analysis, McGraw Hill, N.York
6. H.B Maynard Associates, Industrial Engineering (Handbook), Prentice Hall, N.York.
7. Ebert and Adams, Production/ Operations Management, Prentice Hall of India, N.Delhi

IE 509: INDUSTIRAL PSYCHOLOGY

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Introduction: Definition, nature and development of work psychology, methods of research, basis of job related behaviour - individual and situational variables.

Individual and their evaluation, role of heredity, environment, types of individual.

Psychological tests in industries, their utility, reliability and validity

Human Engineering: Job Methods, Time study, Fatigue, Work Environment, Accidents and safety.

Motivation and frustration; Work motivation, Theories (contents and cognitive) and applied implication incentives, moral, job satisfaction.

Frustration symptoms and coping strategies.

Attitudes and Conflicts: Defination, sectors, influcing attitude measurement and attitude change.

Conflict, nature, level and its sources.

Work stress and metal health: Stress and stressors, sectors, pre-disposing and individual to stress and cost of work stress – general principals of coping with stress, individual and organizational strategies in stress management

Counseling.

Job Redesign and new technologies: Human factor approach to job design, man machine system, work methods, control, play, linkages, work space envelops.

Jobs simplification, job enrichment, job enlargement.

New Technology – introduction and its implications for the organization.

Reference Books:
1. Work Psychology – Understanding Behaviour at work by John Earnold, Robertson and Cooper
2. Industrial Psychology by Tiffin and Meccormic
3. Social Psychology of Organization Behaviour by Katz and Kahn
4. Handbook of Industrial Psychology Porter and Lawler
5. Industrial Psychology by Ghosh and Ghorpede

Elective - I
IE 510: MATERIAL MANAGEMENT

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Scope and importance of materials and inventory Management, Functions and objectives of material Management, Suppliers and purchasing function, Purchasing objectives and procedures, Quality considerations in purchasing, Receiving and shipping, The receiving functions and shipping systems.

Traffic and physical distribution: Classifying inventory problems, Number of items, nature of demand, number of times period, lead time, stock outs, inventory costs, inventory management systems.

ABC inventory analysis: Control system for independent demands, Cycle counting, decision models for inventory Management, Economic order quantity (EOQ) model, Determing an inventory policy for EOQ model, Economic production lot size model, An inventory model with planned shortages, Lot sizing for dynamic demand, Periodic order quantity, para period balancing, service levels and uncertainty in demand, Single period inventory models, simulation models for inventory analysis.

Reference books:

1.	Production and materials Management	Bhagde, S.D USG pub.
2.	Production and inventory control	Plossl, G.W & Wright, O.W Prentice Hall
3.	Purchasing Management	Lee Lamber

IE 511: FACILITIES PLANNING AND DESIGNING

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Importance of plant lay out in plant design, types of layout, factors affecting design of plant layout, principles of plant layout design, importance of facilities planning, location factors & analysis, Systematic planning of industrial facilities, phases involved in SPIF, layout evaluation heuristics, heuristics for line balancing, Qualitative & quantitative techniques for plant layout decision, Computerization layout planning, classification of computerized layout planning olgorithms, description of various algorithms for layout planning, integrating plant layout and material handling systems, systems approach to material handing, selection of MH equipment, characteristic features of various MH systems, automated guided vehicle systems and automated storage & retrieval systems.

Recommended Books:

1.   Richard Muther, Practical Plant layout, McGraw Hill Book Company, New York
2.   Vijay Sheth, Facilities Planning and Materials Handling, Marcle Decker, New York.
3.   Tompkins, While Facilities Planning, John Wiley & Sons, New York.
4.   J.M Apple, Plant Layout & Material Handing, John Woley & Sons, N. York
5.   Francis White, Facility Location & Layout, PHI, New Delhi
6.   G.K Aggarwal, Plant layout & material handling, Jain Publishers, New Delhi
7.   Krajewski, Operations Management, Pearson Education, New Delhi

IE 512:   SYSTEMS ANALYSIS AND DESIGN

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

System Theory and Concepts – Systems defined, functional elements of a system, general theory, system theory and organization, system concept and Management, the system approach, planning and system concepts, control and system concepts, information and system concepts.

Quantitative technique of system analysis – system analysis, problem solving, scientific method, mathematical analysis, models, computer techniques of analysis linear programming input output analysis, queuing and Monte Carlo Techniques, simulation, industrial dynamics.

Behavioral aspect of system design – The motivation factor in system design, leadership factors in system design, the need for systematic human relationship, the need for system changes, resistance to changes, behavioral consequences of system changes, micro analysis of man – machine open concept as a basis of human integration, meeting then human and social problems.

Flow system – increasing complexity in distribution and production, increasing cost of distribution, the total flow system, planning the transformation, service system integrating system.

Prgoram Management – Impact of advancing technology, large scale integrating systems, program Management concept, functional stages of program Management, organizational modifications, matrix organization applications of program Management.

Management cybernetics – Management cybernetics in controlling a manufacturing firm, production and inventory control system, production, inventory and employment control system, the enterprise control system.

Reference Books:

Management of Systems	Nauhria, R.N & Parkash Rajnish	Wheeler Pub.	1995
Modern Production Management	Elwood, S. Buffa	Wiley Estern	1984
Production/Operation Management	Richards, I.Kvin	Tata McGraw Hill	1979

IE 513:   ORGANIZATION THEORY AND BEHAVIOUR

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time Allowed 3 Hrs.

Concept of organization and management. Development of management thought; different theories of management. Japanese management. Planning and planning process. Decision making. MBO, Decentralization, Span of management, Delegation. Line staff and functional relationship. Beurocratic organization.

Role of behavioral sciences in organization. Individual behaviour, different theories of motivation. Interpersonal and group behaviour, transactional analysis and group dynamics. Importance of human relations. Controlling and directing human behaviour in organization. Leadership, theories of leadership and leadership styles, managerial grid, organizational conflicts, organizational effectiveness. Communication significance, process and variables.

Concept of personal management and industrial relations, role and scope. Planning personnel functions – Human resource development, functions and operations of personnel department, employees selection, recruitment and training. Job description and analysis, career planning, transfers and promotions. Compensation planning, wages and salary administration. Concept of workers participation in management.

Reference Books:

Organization Behaviour	Newstorm, J.W & Keith, Davis	Tata McGraw Hill	1995
Organization Behaviour	Ahuja, K.K	Kalyani Publisher	1990
Organization Behaviour	Luthans, F.	Tata McGraw Hill	1995
Organization Behaviour	Prasad, L.M	Sultan Chand & Sons	1996
Personnel Mgt. & Behaviour	Tripthi, P.C	Sultan Chand & Sons	1994
Personnel Management	Flippo, E.B	Megraw Hill	1984
Management of Human Resources	Prasad, Ladies & Bannerjee	Sterling Pub	1994

Elective - II
IE 514: MAINTENANCE & RELIABILITY ENGINEERING

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks 100
Time Allowed 3 Hrs.

1. Maintenance in context: maintenance and profitability, terro-technology, application of terro-technology.

2. Principles: the structure of plant, reason for nature of maintenance work, the production maintenance system a dynamic model.

3. Establishing a maintenance plan-preliminary consideration: items, classification of items, maintenance procedure, guidelines for machine procedures to items.

4. Maintenance planning and control: Basic requirements, Management information, labour costs, computer based Management information system, work planning and work control, basic rules for success.

5. Introduction: Reliability concepts and patterns of failure, reliability Management, reliability, for system effectiveness.

6. Reliability and hazard rates: Failure data, reliability function, failure rate and hazard rate, common distributions in failure mechanisms – experimental, Welbull, gamma, Normal, log normal, extreme value, model selection for components failure, failure analysis.

7. Reliability prediction and analysis: reliability prediction based on exponential distribution, system reliability analysis – block diagram method, fault tree and success tree methods, event tree method, failure model, failure mechanism.

8. Reliability design: Design for reliability, design process, assessment methodology, reliability allocation, reliability improvement, selection of components to improve system reliability.

Reference Books:

Industrial Engineering and Management	Khanna O.P	Dhanpat Rai & Sons	1994
Maintenance Planning and Control	Kelly A	Buttersworth & Co.	1984
Maintenance and Spare parts Management	Krishnan G.	Prentice Hall	1991
Reliability Engineering and	Gupta, A.K	Macmillan India Ltd.	1996

Technology
Introduction to Reliability Engineering Lewis E.E   John Willey & Sons
Reliability Engineering   Srinath L.S   East West Press   1991

IE 515 ADVANCE MANUFACTURING PROCESS

Note: The examiner will set eight questions. Candidate is required to attempt any five
questions.

Max. Marks   100
Time Allowed 3 Hrs.

Development and classification of non-conventional manufacturing processes, considerations in processes selection. Machines of material removal, tool design, effects of process parameters on MRR, accuracy and surface finish and applications of the various non-conventional machining processes like Ultrasonic Machining (USM) abrasive & water jet machining (AJM), Electro Chemical Machines (ECM), Electro Chemical Grinding (ECG), Chemical Machining (CHM), Electrical Discharge Machining (EDM), Electron Beam Machining (EBM) and lon Beam machining (IBM) processes.

High Energy Rate Forming Methods (HERF) Comparative Study of Conventional and High Velocity Forming of Metals, Review of Theory of plasticity, Principle, Process Parameters, equipment & mechanics of explosive forming, electro-hydraulic forming, magnetic pluse forming, Application of HERF Techniques.

Recommended Books:

1. Pandey & Shan, Modern Machining Processes, Tara McGraw Hill, N.Delhi
2. P.K Mishra, Non Conventional Machining, Narosa Publishing House, N.Delhi
3. Amitabh Bhattacharya, New Technology, Institution of Engrs (I) Calcutta
4. ASTME, High Velocity Forming of Metals, PHI, N.Delhi
5. Ghosh & Mullick, Manufacturing Science, New Age publishers Pvt. Ltd. N. Delhi
6. Serope Kalpak Jain & Steven R. Schmid, Manufacturing Engineering & Technology, Addison Wesley Ltd.. N. Delhi

IE – 516 INDUSTRIAL ECONOMICS AND ACCOUNTING

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time allowed 3 Hrs

Nature, scope an role of financial accounting – double entry system, basic concept and conventions of accounting. Accounting records and systems- journal, ledger, cash book and trial balance; measurement of income; assets and liabilities; depreciation; limitations of accounting; price level changes. Preparation of profit and loss account and balance sheet as per the Indian Companies Act. Analysis and interpretation of financial statements. Tools of analysis.

Role of business economics and statistic in managerial decision making. Elements of statistics tabular and graphic presentation of data, frequency distributions, measure of average and dispersion, probability concepts and use of standard probability distributions in risk analysis, simple correlation and regression equation analysis. Forecasting business changes and use of index numbers and growth analysis. Decision making under risk and uncertainty. Deterministic models of decision making. Uses of elasticities of demand in demand forecasting. Production function and resource substitution. Breakeven analysis. Optimum utilization of limited resources.

Reference Books:

Management Accounting-	Khan, M.Y. & Jain, P.K.	Tata McGraw Hill	1995
Cost and Management Accounting-	Saxena, V.K. & Vasisht, C.D.	Sultan Chand & Sons.	1995
Principles of Engg. Economy-	Engene, L Grant.	John Wiley	1990
Modern Engineering Economy-	Donovan	John Wiley	1993
Introduction to Mgt. Accounting-	Horngren, C.T. & Sundlem, G.L.	Prentice Hall	1990

IE 517 MANAGEMENT INFORMATION SYSTEM

Note: The examiner will set eight questions. Candidate is required to attempt any five
questions

Max. Marks: 100
Time Allowed: 3 Hrs.

Concepts, needs and scope of MIS in business organization

Understanding business as a social system and approach to management and organization theory.

Types of management information systems. The system elements. Distinction between physical system and information system.

Design and implementation of MIS. Components of MIS, systems flow charts, developing data base, MIS and integration of sub-system, developing organization structure for MIS, MIS and control system.

Computer and MIS, different computer programming languages used in business management. Uses of software packages and computer games for business decision making.

Reference Books:

Information Systems for Modern Management	Mudric, R.G. Ross, J.E. & Clogget, J.R.	Prentice Hall	1992
Management Information System	Davis, G.B. & Olsen, M.H.	McGraw Hill	1985
Management Information Systems	James, A.O Brien	Galgotia Pub	1991
Computers and Information Technology	Puri, Y.P. & Puri, Vipin	Global Business Press	1992

IE--518   Lab-I

Max. Marks: 100
Time Allowed: 2hrs

One lab /field/industrial oriented project /problem will be allocated to each student related to the subjects related to the subjects taught in 2nd semester.

Elective – III
IE 519– INDUSTRIAL AUTOMATION

Note: The examiner will set eight questions. Candidate is required to attempt   any five questions.

Max. Marks   100
Time Allowed 3 Hrs

Concept of automation in industry, mechanization and automation, classification of automation systems.

Air cylinders –their design and mounting; pneumatic and hydraulic valves- flow control valves, metering valves, direction control valves, hydraulic servo systems; pneumatic safely and remote control circuits.

Basis of automated work piece handling- working principles and techniques, job orienting and feeding devices. Transfer mechanisms- automated feed cut of components, performance analysis.

Assembly automation, automated packaging and automatic inspection.

Programmable control- Introduction, NC controller technology, computer numerical control combined with DNC/CNC systems, adaptive control machining systems.

Computer aided retrieval type process planning systems, generative process planning systems, benefit and CAPP, machineablity data systems. Computer generated time standards.

Introduction to robot technology- robot physical configuration and basic robot motions. Types of manipulators- constructional features, servo and non servo manipulators. Feedback systems and sensors- encoders and other feed back systems, vision, ranging systems, tactile sensors. Programming languages- description of VAL and other languages. Artificial intelligence- legged locomotion and expert systems.

Reference Books:
CAD/CAM-   Groover, M.P. &   Prentice Hall   1987
                        Zimmer, E.W.

Robotics for Engineers-	Yoram Koren	McGraw Hill	1992
Robot Manipulators-	Paul, R.P.	MIT Press	1993
Numerical Control and CAM-Pressman, R.S. & Williams		John Wiley	1993
Fluid Power Control	Shearer P.	John Wiley	
Hydraulic and Pneumatic Power for Production	Stewart	Industrial Book	
Industrial Robots Vol. I	Tunnel	SME	

IE – 520 BUSINESS POLICY AND STRATEGIES

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time allowed 3 Hrs

Business policy as a field of study- conceptual frame work for integrated business policy and strategy including an understanding of planning and decision making process in business enterprise.

Analysis and evaluation of potential risks and opportunities in changing economic, political and technological environment. SWOT analysis. Social responsibility of business.

Strategic planning concept of strategy and firm's business, components of strategy. Growth and diversification strategies, policy, strategy and tactics; corporate planning in India.

Implementation of strategy- developing organization structure and climate, medium and short range programming. Relevant case studies.

Reference Books:

Business Policy-	Kazmi, M.M.	Tata McGraw Hill	1992
Business Policy-	Balasubramaniam	Kalyani Pub.	1992
Business Policy-	Ghosh, P.K.	Sultan Chand & Sons	1990

IE – 521 VALUE ENGINEERING

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time allowed 3 Hrs

Concept of value, cost and price, customer and value, philosophy and objectives of value analysis, types of value, areas of application of value engineering, limitations of value analysis, difference between value engineering and cost reduction techniques; Tool of technology in value analysis, method & engineering, cause and effect diagram, SWOT analysis, break even analysis, system approach; Job plan for value analysis approach: Information Phase, Function Phase, Creation Phase, Evaluation Phase, Recommendation Phase, Implementation Phase, Audit Phase; Value Engineering Cell, Value Manual, composition of cell, cost cutting, various cost cutting techniques; Case studies in value engineering and analysis from manufacturing and service industries.

Recommended Books:

1.   Mudge, Value Engineering, SAVE, N.York
2.   Miles Lawerence, Techniques of value analysis and value engineering, McGraw Hill, N.York
3.   ASME, Value Engineering in Manufacturing, Prentice Hall India, N.Delhi
4.   Getting More at less Cost Value Engg. Tata McGraw Hill, N.Delhi
5.   Parker, D.E. Value Engg. Theory, L.D. Miles Value Foundation, N.York

IE – 522 QUALITY ASSURANCE

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks 100
Time allowed 3 Hrs

Objectives and functions of inspection in industry, organization of inspection, inspection methodologies and procedures, non-destructive testing, radiography, magnaflux, fluorescent penetrant inspection and ultrasonic testing, automatic sizing and inspection, computer aided inspection, economics of inspection, reference to relevant BIS codes.

Quality control concept and objectives, organization for quality control, factors in quality design management, concept and use of quality circles. Quality assurance, total quality management, certification system, ISO-9000 and ISO-14000 series of standards.

Theory of statistical tolerances, general theory of control charts, control charts for variable attributes, group control charts, control charts with variable group size, moving average and moving range charts acceptance control charts for trended universe average, cumulative sum control charts, difference control charts.

Acceptance sampling, multiple and sequential sampling plans, multi-level sampling plans, acceptance sampling by variables, advantages and limitations, sampling plans by using different criteria, techno-economic comparison of various types of sampling plans.

Basic concept of reliability, its importance in quality design, methods for its improvement, failure rate curve, life testing, quality-reliability relationship, use of Q.C. curves.

Reference Books:

Inspection and Gauging-	Kenedy, E.V. & Andrews Donald.	Industrial Press Inc.	1977
Quality Planning and Analysis-	Juran, J.M. & Gryan, F.M.	Tata McGraw Hill	1995
Statistical Quality Control-	Grant, E.L. & Richards, S.L.	McGraw Hill	1988

Elective IV

IE 523: PRODUCT DESION & DEVELOPMENT

Note: The Examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time allowed 3 Hrs.

Creative thinking and organizing for product innovation. The product design function. Locating ideas for new products, selecting the right product. Qualifications of the product design engineer. Creative thinking. Curiosity and imagination. Ideas generate ideas. Taking time to think. Using a systematic producer for product innovation. Setting responsibilities for new product development. Structural units for new product development, Functions of the new product development unit. Opportunities for the product design engineer.

C4riteria for product success: Areas to be studied preparatory to design .The value of appearance Principles and laws of appearance Incorporating quality and reliability into the design. Man-machine consideration. Designing for case of maintenance.

Cost and product development: Source of funds for development cost product costs. Estimating the product cost. Kinds of cost procedures, Cost reduction.

Integrated approach to product development: Diffusion of innovation. Generation, screening and development of new product ideas. Product life cycle and new product development. Economic analysis-evaluation of new product ideas/ concepts. Value analysis. Test marketing of new product launch.

Reference books.

Product design and Manufacturing	Chitale and Gupta	Prentice Hall	1997
Taguchi Methods Explained (Practical steps to robust design)	Bagchi	Prentice Hall	1997
Product design and process Engineering	Nible & Drper Mc Graw Hill		
Design and Marketing of new products 1980	Urban G.L & Houser Prentice Hall		
Marketing management 1990	Kotler Phillips	Prentice Hall	
New product Development 1987 (it is Marketing Research & Managerial Calculate)	Mascarenhas	Oxford	
Product Management 1967	Kaushal O.P	Lalvani Pub. House	
The Management of Innovation 1961	Burns & Stalk	TasstochPublication	
Source book for Creative Thinking	Parents S. J &	New York	

Journal:
1. Machine Design
2. Design Engineering

IE 524:INDUSTRIAL PACKAGING

Note: The Examiner will set eight questions. Candidates are required to attempt any five questions.

Max Marks. 100
Time allowed 3 Hrs

Introduction to packaging. Definition and objectives, nature and classification of industrial predictors with regard to packaging, nature of the packaging problem, types of packages and their classification s.

Packaging materials, their types. Nature and physio - Mechanical properties pertinent to packaging requirements, requisites of a good packaging material, Bureau of Indian Standard Specifications for selected packaging material.

Packaging design, package as a product, design considerations and aspects of package design viz. functional requirements. size shape. From, style, finish. graphics, visual appeal, storage, handling transportation, safety economics etc. Ecological considerations in packaging.

Manufacturing technology, estimating and production planning for packaging production process and equipment for manufacture of paper and cardboard products. Wooden cases and boxes, sheet metal barrels, cans and boxes, metallic collapsible tubes, metal fill covers, plastic containers, plastic bags, glass jars and bottles, ceramic jars and bottles, jute bags, leather cases and bags, surface coating techniques for metal boxes and plastic containers, impact of automation on packing production.

Economic considerations: packaging cost structure, cost reduction, simplification versus diversification, application of value analysis to packaging design for functional improvement and cost rationalization, role of work study in packaging.

Reference Books

Canning and preservation of fruit   Bhatia,S.C   Small Industry Research Institute.
And Vegetables   Delhi   1992
Hand Book of package Engineering Hancon &   Mc Graw Hill   1971
                                           Joseph

IE 525:PROJECT APPRAISAL AND MANAGEMENT

Note: The examiner will set eight questions. Candidate is required to attempt any five questions.

Max. Marks   100
Time allowed 3 Hrs

Introduction:

Concept, objectives and importance of project. Feasibility analysis economic analysis technical analysis and financial analysis. Phase of project appraisal and management. Appraisal and ranking of project. Need and technique for ranking of project. Play back method. Accounting rate of return. Net present value method. Profitability index. Net terminal value method. Sensitivity analysis. Scoring techniques. Multiple internal rate of return rationing, risk analysis.

Risk and uncertainty: different types of risk approaches to incorporation of risk standard deviation and coefficient of variation. Correlation of cash flows overtime. Utility theory and risk aversion. Portfolio risk, capital asset pricing model. Risk analysis in practice. Alternative methods of treating risk.

Inflation and capital budgeting real cash flows and money flows, inflation and discount rate.

Public projects: Social cost-social benefits analysis, social appraisal of, rationale of social cost- benefit analysis, Cost-benefit analysis. Shadow pricing. UNIDO and Little-Mirlee's approaches to social cost-benefit analysis Cost benefit analysis in developing countries. Cost -benefit illustration.

Implementation of project elements of implementation. Techniques of project control. Responsibility accounting. Network techniques - organizational structure. Motivation and incentives. Role of managers. Project audit. Various problems of public sector projects, remedial measures for proper implementation.
Capital budgeting practices in India. Investment appraisal in practice: Indian and foreign studies

Reference Books.

Guidelines fore project Evaluation	UNIDO
Project feasibility Analysis	Cliffton & fyffe, David E.
Successful project	Kharbanda OP & Stalworthy E.A

Manual of Industrial project Analysis OCED
Inn developing Countries

IE 526: ENTREPTRENEURSHIP

Not6e: The examiner will set eight questions, Candidate is requ4ried to attempt any five questions.

Max Marks   100
Time allowed 3 Hrs.

The concept of entrepreneurship the entrepreneurship culture and structure, theories of entrepreneurship. Entrepreneurial traits, types, behavioral patterns of entrepreneurship entrepreneurial motivations, establishing entrepreneurial units.

Search for business ideas sources and selection-project classification and identification. constraints. feasibility, prospects, project objectives, design and appraisal format for report,.

Steps for starting a small industry, selection and type of organization. Incentives and subsidies: Central Government schemes and states Government schemes, incentives to SSI's, registration. Licensing requirements for sales tax excise duty and power.
Entrepreneurial development programs in India: objectives, performance and shortcomings. Selected organizations for EDP, scientific and technological entrepreneurship parks (STEP0 and its role.

Case studies of successful entrepreneurs.

References:

1.   Entrepreneurship Development   Narayan, Laxmi
2   Small scale Industries   Desai, Vasant
3   Entrepreneurship   Hisrich & Peters
4   Small Business Management Fundamentals   Stienhiff & Burgers
5.   Young Entrepreneurs, Effective Management Mukta, Munjal

IE- 527: SAFETY ENGINEERING

Note: Time examiner will set. Eight questions. Candidate is required to attempt any five questions.

Max Marks   100
Time allowed   3 Hrs.

General Industrial work environment and its implications with regard to safety of operators and equipment, safety concepts, safety as essential parameter in the design of industrial of industrial production systems, organization of safety.

Hazards, their nature, consequences and classifications. Hazards analysis techniques, Hazard prevention strat6egies and measures, accident cost and the assessment;

System safety concept. Safety engineering analysis, safety factors in opea5tion and maintenance of plant and equipment, strategic for risk reduction, safety considerations with regard to handling of hand tools, machine tools pressure vessels, pipes, electric lines and fire, types of fire, fire prevention and strategies.

Safety measures. Standards and programs, measuring safety performance, contribution of ergonomics to operator and plant safety, contribution of safety engineering to plant productivity industrial safety acts, dangerous machines act and B.I.S codes on Machinery guarding. Relevant clauses of Indian Boiler Regulations in reference to safety.

Reference Books:

Product Safety Engineering for Managers	Seident.R
Industrial Safety-Management and Technology	Colling D
Hand Book of Industrial Health Engineering	
Occupational safety and Health	Antom
Management	
State Safety regulations	