UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

SEVENTH SEMESTER

OF

BACHELOR OF TECHNOLOGY

IN

PRODUCTION ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SEVENTH SEMESTER

Code	Subject	Hours/Week			Internal Marks	University Examination	
		L	T	P/D		Hrs	Marks
PE04 701	Engineering Economics and Principles of Management	3	1	-	50	3	100
PE04 702	Tool Engineering & Design	3	1	-	50	3	100
PE04 703	Production Management	3	1	-	50	3	100
PE04 704	Management Information System	3	1	-	50	3	100
PE04 705	Elective –I	3	1	-	50	3	100
PE04 706 (P)	Industrial Engineering Lab	-	-	3	50	3	100
PE04 707 (P)	Metrology Lab		-	3	50	-	-
PE04 708 (P)	Project	-	-	3	50	-	-
		16	**5**	**9**	**400**		**600**
15 days industrial tour and subsequent report presentation compulsory.							

ELECTIVE - I

PE04 705 (A) Software Engineering
PE04 705 (B) Project Management
PE04 705 (C) Financial Management
PE04 705 (D) Process Engineering
PE04 705 (E) Maintenance Engineering and Management
PE04 705 (F) Design for Manufacture

SEVENTH SEMESTER

PE04 701 : ENGINEERING ECONOMICS & PRINCIPLES OF MANAGEMENT

(3 hours lecture and 1 hour tutorial per week))

Objectives:-

Managing of activities as well as decision making is an important job of a Production Engineer in an organization. Hence they are expected to have a basic knowledge on economic theories, and their applications, management concepts, functions of management, human behavior at work etc. This subject covers the fundamental aspects related to all these areas.

Module I (13 hours)

Overview of Managerial Economics – Theory of Firm – Basics of Demand – Demand curve – Market supply function – Supply curve – Market Equilibrium

Demand Analysis – Basics for consumer demand – Consumer choice –Optimal consumption – Demand sensitivity analysis – Price elasticity of demand – Price elasticity– Cross price elasticity of demand – income elasticity of demand.

Module II (13 hours)

Production and cost analysis – Production function – Total marginal and average product – Law of diminishing returns - input combination choice - Marginal revenue product and optimal employment - Input demand function – optimal combination of multiple inputs – returns to scale – Productivity measurement.

Perfect competition and monopoly – monopolistic competition and Oligopoly - Pricing practices - optimal pricing policy - Mark-up pricing – Price discrimination – Multiple product pricing – Transfer pricing

Module III (13 hours)

Introduction to Management – Definition – Principles – Philosophy and development of management thought – Functions of management – Planning –Organizing – staffing – leading – controlling – Different types of Organizational structures and relationships – Decision making – Types of Decisions – Decision making under uncertainties, risk and certainty – criteria

Module IV (13 hours)

Human behavior and management – skills of manager at various levels in an organization – Human relations – Leadership and management – theories of leadership – leadership functions and qualities – Motivation and behavior – Theories of Maslow, McGregor, Herzberg and McClleland – Management by Objectives and Exception.

Reference books

1. Koontz & Weirich, *Management,* McGraw-Hill Publishers
2. Vohra, *Quantitative techniques in management*, McGraw hill Publishers
3. Hersey Paul and Blanchard, *Management of Organizational behavior*, Prentice Hall
4. Luthans, *Organizational Behavior,* Mc Graw Hill Publishers
5. Mark Hirschey, *Managerial Economics 10th Edition* , Thomson South Western Publishers
6. Jit S Chandran, *Organisational Behaviour,* Vikas Publishing

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. Preferably all questions are of descriptive type..)

PE04 702 : TOOL ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objective:-

The selection of proper cutting tool is important for any production system. The subject is intended to give an exposure on different cutting tools, clamping and fixing methods and jigs used for different operations like turning, boring, milling, drilling, etc. It also gives exposure to piercing and blanking operations. The students will be able to select proper cutting tools, jigs and fixtures after this course.

Module I (13 hours)

Design of Cutting Tools :- Brief history of metal cutting process - design of single point cutting tools for turning, boring, shaping, planning and slotting - design of multi point cutting tools :- milling cutters, drills, reamers, taps and dies – classification of multipoint cutting tools – simple problems

Module II (13 hours)

Principles of location and clamping – locating and clamping methods and devices – design of drill jig – types of drill jigs – general considerations in the design of drill jig – drill bushings – methods of construction – jigs in modern manufacturing – problems on design of simple jigs

Module III (13 hours)

Design of Fixtures :- Fixtures and fixture economics – types of fixtures – Vice fixtures – Milling fixtures – Boring fixtures – Broaching fixtures – Lathe fixtures – grinding fixtures – problems on design of simple fixtures.

Module IV (13 hours)

Design of sheet metal blanking and piercing dies: - Introduction to die cutting operations – Presses – Cutting action in punch & die operations – die clearance – blanking & piercing die construction – pilots – strippers & pressure pads – simple problems

Text Book

1. Cyril Donaldson, George.H.Lecain, V.C.Goold, *"Tool Design"*, TMH publishing Co., 3rd edition

Reference books

1. "*Fundamentals of Tool Design*, ASTME
2. "*Production Technology*", HMT
3. G.R.Nagpal,"*Tool Rngineering & Design*", Khanna Publishers, 4th edition

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. At least 30% weightage for numerical problems.)

PE04 703 : PRODUCTION MANAGEMENT

3 hours lecture and 1-hour tutorial per week

Objectives :

Production/Operation function is an important activity in an organization which is concerned with the value addition of products and services having requisite quality level with efficiency and effectiveness. This Subject deals with some of the important aspects related to Production management viz..... Production Planning and Control, materials Management and Quality management.

Module I (13 hours)

Production and Operations planning - _Production Systems - Forecasting of Demand- Variables – Opinion and Judgmental Methods - Time series methods – Regression & Correlation – Aggregate planning- Objectives - Aggregate planning Methods - Master Scheduling – Objectives – Methods of Master Scheduling

Module II (13 hours)

Material and Capacity requirements planning – MRP Concepts – MRP Logic – System refinements – Capacity management – Manufacturing resource planning (MRP II) – Scheduling and controlling of production activities – Objectives - Scheduling strategy and guidelines - methodology – priority control – capacity control - Scheduling for Job shop, Batch shop and high volume continuous systems- Concepts of ERP

Module III (13 hours)

Materials management- functions of purchasing and materials management – quality – inspection – sources of supply – pricing – inventory management – EOQ- models of replenishment – deterministic and probabilistic – P and Q systems of Inventory – Selective inventory management – ABC,VED,FSN,HML analysis of Inventory – Concept of JIT and zero inventory

Module IV (13 hours)

Introduction to Quality Management – growth from Inspection to Total Quality management- Engineering fundamentals –QC Tools- Control charts for variables – process capability – control charts for attributes – acceptance sampling by attributes – single, double, multiple and sequential sampling – Operating characteristic and AOQ curves – Quality Assurance- ISO 9001 Standards – Concepts of Total Quality Management

Reference books

Joseph G Monks, *Operations Management*, *Theory and Problems*, McGraw-Hill International edition

Setharama, L Narasimhan etal.. *Production Planning and Inventory Control*, Prentice Hall India

Elwood S Buffa, Rakesh K Sarin, *Modern Production and Operations management*, John Wiley &Sons

S N Chary, *Production and Operations management*, Tata McGraw-Hill Publishing co. Ltd.
Panneerselvam, *Production management*, Prentice Hall of India
N G Nair, *Production and operations Management*, Tata McGraw-Hill
Goplalakrishnan, *Materials Management*, McGraw-Hill publishers
Krajewsky, *Operations Management – Strategy*, Pearson education
Harold T Amrine, John A Ritchey, *Manufacturing Organization and Management,* Pearson Education

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short descriptive type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one, numerical problems expected
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one, numerical problems expected
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one, numerical problems expected
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one, numerical problem Expected
(Q II to V can have 2 subdivisions. At least 40 % Weightage for Numerical problems.)

PE04 704 : MANAGEMENT INFORMATION SYSTEMS

3 hours lecture and 1 hour tutorial per week

Objectives:

Information is a vital resource to management for decision making and processing of information is an important organizational activity. Production is crucial activity which needs correct information for timely decisions and Engineers should be aware of information sources, flow and its processing for making correct decisions. This subject deals with fundamentals of MIS and application of MIS for managing information.

Module I (13 hours)

Introduction– Overview- Subsystems - Structure of Management Information System–Operating elements–Decision support–Management Activity - Organizational function – Synthesis 0f Structure – Hardware, Software and communication technology for information systems – Computer System- Data Representation - Storage and retrieval of data – Logical data concepts and definitions –

Module II (13 hours)

The Decision making process –Phases in Decision making – Concepts of Decision making – Behavioral Models-Concepts of Information- Definition- Information in the mathematical theory of communication – Information presentation – Quality of Information – Value of information- Age of information -Humans as information processors- General and the Newell-Simon Model – System Concepts –Definition – General model – Types of Systems – Subsystems –System Concepts and organizations- System Concepts applied to MIS.

Module III 13 hours)

Concepts of planning and control – Organizational planning – Planning process – Computational support Characteristics of control process – nature of control in organizations - Organizational structure and management concepts - Basic Model of organizational structure- Modifications of basic structure – Information processing model - Developing long range information system plan – Planning for information systems – Content of Master plan – Nolan Stage model- Three stage model – Methodology of System Design – Feasibility study – data gathering techniques – documentation – forms design codification and classification.

Module IV (13 hours)

Strategy approach for to the determination information requirements – Three levels – Purposes of a method – Strategies for determination of requirements - Developing and implementing application systems – Contingency approach – Prototyping approach - Life Cycle approach - Quality assurance and evaluation of information systems – Concept of Quality – Quality assurance for applications – Auditing of information systems - Future developments and their organizational and social implications

Text book

Davis G.B. & Olson M.H., *Management Information Systems - Conceptual Foundation*

Structure and Development, McGraw-Hill International Edition

Reference books

(1) Ross & Murdick G.R., *Information Systems for Modern Management,* Prentice Hall
(2) Ross J.E., *Information Systems*, Prentice Hall,
(3) Lucas H.C. Jr., *Analysis, Design and Implementation of Information Systems ,*
(4). Martin J.L., *Information Management*, *The Dynamics of MIS,* T M H
(5) Effy Oz, *Management Information Systems*, Thomson Course Technology

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(Q II to V can have 2 sub divisions .Preferably all questions are of descriptive type..)

PE04 705(A) : SOFTWARE ENGINEERING

3 hours lecture and 1hour tutorial per week

Objectives:
The paper aims at providing the students the basic concepts and requirements regarding the design validation, implementation and evaluation of Software systems.

Module I (13 hours)
Introduction - FAQs about software engineering - professional and ethical responsibility - system modeling - system engineering process - *the software process* - life cycle models - iteration - specification - design and implementation - validation - evolution - automated process support - *software requirements* - functional and non-functional requirements - user requirements - system requirements - SRS - *requirements engineering processes* - feasibility studies - elicitation and analysis - validation - management - *system models* - context models - behavior models - data models - object models - CASE workbenches

Module II (13 hours)
Software prototyping - prototyping in the software process - rapid prototyping techniques - *formal specification* - formal specification in the software process - interface specification - behavior specification - *architectural design* - system structuring - control models - modular decomposition - domain-specific architectures - distributed systems architecture - *object-oriented design* - objects and classes - an object oriented design process case study - design evolution - *real-time software design* - system design - real time executives - *design with reuse* - component-based development - application families - design patterns - *user interface design* - design principles - user interaction - information presentation - user support - interface evaluation

Module III (13 hours)
Dependability - critical systems - availability and reliability - safety - security - critical systems specifications - critical system development - *verification and validation* - planning - software inspection - automated static analysis - clean room software development - *software testing* - defect testing - integration testing - object-oriented testing - testing workbenches - critical system validation - *software evolution* - legacy systems - software change - software maintenance - architectural evolution - software re-engineering - data re-engineering

Module IV (13 hours)
Software project management - project planning - scheduling - risk management - *managing people* - group working - choosing and keeping people - the people capability maturity model - *software cost estimation* - productivity estimation techniques - algorithmic cost modeling, project duration and staffing *quality management* - quality assurance and standards - quality planning - quality control - software measurement and metrics - *process improvement* - process and product quality - process analysis and modeling - process measurement - process CMM - *configuration management* - planning - change management - version and release management - system building - CASE tools for configuration management

Text book
Ian Sommerville, *Software Engineering*, Pearson Education Asia

Reference books

1. Pressman R.S., *Software Engineering*, McGraw Hill
2. Mall R., *Fundamentals of Software Engineering*, Prentice Hall of India
3. Behferooz A. & Hudson F.J., *Software Engineering Fundamentals*, Oxford University Press
4. Jalote P., *An Integrated Approach to Software Engineering,* Narosa

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 sub divisions. Preferably all questions are of descriptive type..)

PE04 705(B) : PROJECT MANAGEMENT

3 hours lecture and 1-hour tutorial per week

Objectives:

Projects deal with decisions on capital investment or capital projects. Production engineers have got an important role in conceiving of ideas in projects. This subject gives an exposure to the major aspects of project viz... Project, Planning, Analysis, Selection, Implementation and review.

Module I (13 hours)

Planning - Capital Expenditures – Phases of Capital Budgeting – Levels of decision Making – Facets of Project analysis- Feasibility Study – Objectives of Capital Budgeting – Resource Allocation framework- Key Criteria- Elementary Investment strategies – Portfolio planning tools – Generation of project Ideas – Monitoring the environment – Corporate appraisal – Scouting for project ideas – Preliminary Screening – Project rating index – Sources of Positive net present value

Module II (13 hours)

Analysis – Market and demand analysis – Situational analysis and specification of objectives – Collection of secondary information - Conduct of market survey – Characterization of Market – demand Forecasting – Market planning – Technical analysis- Material inputs and utilities – Manufacturing process/technology – Product Mix – Plant capacity – Location and site -machineries and equipments – Structures and civil works – Project charts and layouts – Work schedule – Financial Analysis – Cost of project – means of finance – Estimates of sales and Production – Cost of production – Working capital requirements and its financing – Profitability projections – Break even point – projected cash flow statements and balance sheets

Module III (13 hours)

Project Cash flows – Basic Principles for measuring cash flows – Components of cash flow – Cash flow illustrations – Viewing a project from different points of view – Time value of money – Future Value of a single amount – Future value of an annuity – Present value of a single amount – Present Value of an annuity- Cost of capital – Cost of debt capital – cost of preference capital – Rate of return – Cost of external equity and retained earnings - Determination of weights – Appraisal criteria – Net present value – Cost benefit ratio- Internal rate of return- Urgency – payback period

Module IV (13 hours)

Implementation- Forms of Project organization – Project planning – Project control – Human Aspects of Project management – Network Techniques – Development of Network – Time estimation – Critical path determination – Scheduling under limited resources – PERT Model – CPM Model – Network Cost System – Project review- Initial; review – Performance

evaluation – Abandonment analysis

Text Book :

Prasanna Chandra, *Projects Planning, Analysis, Selection, Implementation and Review, Fourth Edition*, Tata McGraw-Hill.

Reference books

1. Dennis Lock, *Project Management*, Grower Publications
2. Prasanna Chandra, *Financial Management Theory and Practice*, Tata McGraw Hill Publishers
3. Parameswar P Iyer, *Engineering Project management*, Vikas publishers
4. Gido & Clements, *Successful Project Management,* Vikas Publishers
5. Harold.T..Amrine John.A.Ritchey, *Manufacturing Organisation and Management,* Pearson Education

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(Q II to V can have 2 subdivisions. At least 25 % Weightage for Numerical problems.)

PE04 705(C) : FINANCIAL MANAGEMENT

3 hours lecture and 1 hour tutorial per week

Objectives:

The subject seeks to explain the various concepts of Financial Management and accounting.The student should know the costs related to the various resources that have been deployed and the impact of the decisions on the performance of the enterprise.After completing this course he is expected to understand Financial Management as a business language.

Module I (13 hours)

Introduction to Financial Management – functions and role – fundamentals of accounting – understanding financial statements and its analysis – ratio analysis

Module II (13 hours)

Management accounting – cost concepts – elements of cost and cost sheet – cost-volume-profit analysis – costing for decision making – control and responsibility accounting – budgetary control

Module III (13 hours)

Time value of money – Capital budgeting – methods of appraisal – cost of Capital and its measurement – capital structure planning - valuation of firms – dividend policy

Module IV (13 hours)

Management of current assets – management of receivables – inventory costs – introduction to international finance

Text books

1. I.M.Pandey., *"Financial Management"* Vikas Publications
2. I.M.Pandey., *"Management Accounting"* Vikas Publications

Reference books

1. Khan & Jain, *" Financial Management",* TMH
2. Prasannachandra, "*Financial Management*", TMH
3. Dhameja & Sastry, "*Finance & Accounting*", Wheeler Publishing
4. A A Atkinson *"Management Accounting*" Pearson Education
5. Jame C.Van Horne, *"Financial Management*", Pearson Education

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one, numerical problems expected
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one,

numerical problems expected
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one, numerical problems Expected
(QII to V should contain 2 subdivisions. At least 40% weightage for numerical problems.)

PE04 705(D) : PROCESS ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objectives:

This paper deals with factors to be considered while creating or selecting a process plan. The influence of dimensions, design, w/p handling, tooling etc. are dealt with.

Module I (13 hours)

General manufacturing processes - organisation chart - product engineering - process engineering - preliminary part print analysis - establishing general characteristics of workpiece - identifying finishing operations - relating part to assembly - measuring geometry and surface quality - basic process operations - auxiliary process operations - workpiece control - equilibrium theories - concept of location - geometric control - dimensional control - a brief review of tolerance chart – simple numerical problems.

Module II (13 hours)

Influence of process engineering on product design, influence of material on process cost - eliminating/combining operations - group technology - selection of proper tooling - effect of operating parameters - operation classification - major process sequence - factors influencing - combining operations - examples of shaft type and prismatic type components

Module III (13 hours)

Relationship between process selection and machine selection - sources of information - special purpose and general purpose equipment - cost and design factors - concept of depreciation and methods - simple problems - comparative cost analysis - leasing of equipment - workpiece handling equipment - unitised equipment controls - special process equipment - rules for automation - a typical layout of a process industry - maintenance methods - breakdown - preventive - predictive - maintenance schedule

Module IV (13 hours)

Sources of tooling - tools - tool holders - workpiece holders - moulds - patterns - core boxes - dies - templates - gauges - process picture - symbols - process picture sheet - processing dimensions - operation routing chart - typical orders and requests made from process engineering department - labour cost - material cost - overhead cost - cost calculations for component produced by - machining - welding - casting - forging - cost grid computation of sales cost - case studies

Text books

1. Johnson G.E. & Eary D.F., "*Process Engineering*", FLPH
2. Balakshin B., "*Fundamentals of Manufacturing Engineering*", MIR Publishers

Reference books

1. Kovan V.M., "*Process Engineering*", FLPH
2. Korsakov V.S., et at, "*Assembly Practice in Machine Building*" MIR Publishers
3. Groover M.P., "*Automation, Production Systems and Computer Integrated Manufacturing*", Prentice Hall
4. Jain S.C., "*Mechanical Estimation and Costing*", Dhanpat Rai & Sons

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions.)

PE04 705 (E) : MAINTENANCE ENGINEERING & MANAGEMENT

3 hours lecture and 1 hour tutorial per week

Objectives:
Objective is to expose the students how the deterioration of plant machinery equipment and other facilities are taking place; methods to control/prevent the damage. Also to enable to select and maintain a system with enhanced life period. Make them aware of various testing methods, preventive /corrective and timely actions to take including repair replacement etc.

Module I (13 hours)
Corrosion - harmful effects – electrochemical mechanism of corrosion - forms of corrosion - corrosion by special environments in industries such as chemical, petrochemical, iron and steel industry - corrosion prevention and control - material selection for corrosion environments - corrosion inhibitors - cathodic and anodic protection –corrosion testing and measurements.

Module II (13 hours)
Wear of machine parts - mechanism of wear - different types of wear - effect - factors influencing wear –wear measurements - bearing and lubrication – Types of bearings - bearing material and their requirements - lubricants - basic properties - additives - synthetic lubricants.

Module III (13 hours)
Scope and importance of maintenance - types of maintenance – corrective maintenance - preventive maintenance - concepts of total maintenance - terro technology - strategies and policies of organizing a preventive maintenance programme – monitoring techniques – vibration and noise monitoring analysis – vibration severity chart-shock pulse method-vibration signature analysis-ferrography-spectrometric oil analysis programme.

Module IV (13 hours)
Reliability - definition of reliability - product reliability - time depending relationship to quality assurance - measures of reliability - failure rate - failure distribution curves - MTBF - bath tub curve - reliability improvement - redundancy and its uses - maintainability and

availability - safety and house keeping - replacement analysis - useful and economic life of equipment - reasons for replacement - factors affecting replacement decisions - economic analysis replacement criteria - group replacement – simple problems

Reference books

1. Collacott, *Vibration Monitoring and Diagnosis - Technique for Cost Effective Plant Maintenance,* John Willey
2. Kenneth, Mc Brady M. & W. Kuer J., *Modern Maintenance Management*
3. Uhlig H.H., *Corrosion & Corrosion Control*, John Wiley Publishers
4. Neele M.J., *Tribology Handbook*, Butter Worths publications
5. Maj Gen Apthe S.S., *Plant Maintenance*, Delhi Productivity Council
6. Srinath, *Concept of Reliability*, Affiliated East West Publishers

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions.)

Numerical content 20%

PE04 705(F) : DESIGN FOR MANUFACTURE

(3 hours lecture and 1 hour tutorial per week)

Objectives:

This paper aims at imparting knowledge about the factors that should be considered while designing a component so as to create a manufacturable design.

Module I (10 hours)

Introduction: General design principles for manufacturability-strength and mechanical factors, mechanisms selection ,evaluation method ,Process capability-Feature tolerances-Geometric tolerances- Assembly limits-Datum features-Tolerance stacks.

Module II (13 hours)

Factors influencing form design: Working principle, Material, Manufacture, Design-Possible solutions-Materials choice-Influence of materials on form design-form design of welded members, forgings and castings – Design and manufacturing of gauges – Go gauge, No Go gauge

Module III (13 hours)

Component design-machining considerations**:** Design features to facilitate machining-drills-milling cutters-keyways-Doweling procedures, countersunk screws-Reduction of machined areas-simplification by separation-simplification by amalgamation –Design for machinability-Design for economy-Design for clampability-Design for accessibility-design for assembly.

Module IV (16 hours)

Component design –Casting considerations : Design of casting based on parting line considerations-Minimizing core requirements, machined holes, redesign of cast members to obviate cores.
Re-design for manufacture and case studies: Identification of uneconomical design – Modifying the design – group technology. Computer Application for DFMA.

References

1. Harry peck, *"Design for manufacture"*, Pitman Publication, 1983.
2. Robert Matousek, "*Engineering Design- A systematic approach*", Blackie&sons Ltd., 1963.
3. James G.Bralla, "*Handbook of Product design for manufacturing*", Mcgraw hill co.,

1986.
4. Swift K.G. "*Knowledge based design for manufacture*, Kogan Page Ltd., 1987.
5. Yousef Haik.``*Engineering Design Process*",VIKAS

Internal work assessment
60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. Preferably all questions are of descriptive type..)

PE04 706 (P) : INDUSTRIAL ENGINEERING LABORATORY

3 hours per week

Objectives:
The main objective of a manufacturing organization is improvement of Productivity. Industrial Engineering Deals with techniques that help to scientifically analyze the productive operations of humans and machines for finding out ways and means to improve. This laboratory gives an exposure to students on some of the common industrial engineering techniques which are widely used in Industries

1. Study and Experimentation on Central Limit Theorem - for different population distributions, Triangular Distribution, Rectangular Distribution and Normal Distribution
2. Factorial Experimentation - Analysis of variance and test of Significance on different process/product parameters.
3. Motion Study – Preparation of Flow process chats, outline process charts flow diagram and multiple activity charts, two handed process charts, for industrial operations.
4. Application of Principles of Motion economy – determination of time savings by improving work methods
5. Time Study – Determination of standard time of an operation by stopwatch method.
6. Plant layout and material handling – Layout planning and optimization of material handling using techniques of string diagram travel charting etc.
7. Variable control charts – Plotting and interpretation of variable control charts for X and R and Process capability determination.
8. Attribute Control charts – Plotting and interpretation of attribute control charts P-

Charts and C- Charts

9. Acceptance sampling by attributes – Plotting and interpretation of Operating Characteristic curves, determination of AQL, LTPD, Risks and AOQL
10. Measurement of effect of Work on Human Body – Using ECG, BP Monitor, Tread Mill etc and ergonomical design.
11. Measurement and analysis of productive Skills - Direct and indirect eye hand co ordination measurement using co ordination testers
12. Measurement and analysis of dexterity, speed, skill, visual sensation and tactile sensation abilities – Using coin sorters and match board equipments
13. Measurement and analysis of human visual fields, depth perception – using Depth perception tester and Perimeter.

Reference Books

1. Richard I Levin, David S Rubin, *Statistics for Mangement*, PHI
2. Marvin Mundel, *Motion and Time Study*, Prentice Hall India
3. E l Grant, *Statistical Quality Control*, McGraw Hill.
4. Juran J M, *Quality Control Handbok*
5. *Industrial Engineering Handbook*, Maynard
6. ILO, *Introduction to Work study*, Universal Book Corporation.

Internal work assessment

Practicals & Record	= 25	
Test		= 20
Regularity in Class	= 5	
Total marks		= 50

PEO 707(P) : METROLOGY LAB

3 hours practical per week

Objectives:

The lab provides information of how actual measurements are conducted and also about the selection of measuring instruments for different,purposes.

1. Use of measuring instruments
1. Testing of gears
2 Determination of cutting forces on tool bits -lathe, drilling machine, milling machine and grinding machine
3. Measurement of surface roughness
5. Use of comparators - mechanical, optical, electrical & pneumatic
6. Determination of cutting tool temperature using thermocouples
7. Use of profile projectors,
8. Acceptance Test of machine tools - lathe, shaper, milling and grinding machines .
9. Flatness measurement (Toolmakers microscope - tool geometry)
10. Measurement of vibrations
11. Measurement of area
12 Measurement of sound
13. Measurement of speed

Internal work assessment

Practicals & Record=25
Test=20
Regularity in Class=5
Total marks=50

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PE04 708(P) : PROJECT WORK

4 hours per week

The project work provides the student an opportunity to work in an industry and get a feel of the industrial situations. This also provide him exposure in taking up live industrial problems.

Each student is required to work in an industrial organization selected by the department for his project. He will be with that organization for a period of 2 weeks in 7th semester for familiarization and finalizing the project and he will be with the organization for 4 weeks in 8th semester for completion of the project. His progress will be evaluated by an industrial as well as an academic guide. The academic guide should visit the organization during the project. The student is expected undertake projects preferably in the areas of design , maintenance, manufacturing or management after due consultation with the guides.

Sessional work assessment

Problem formulation and Literature review	=30
Presentation	= 10
Report	= 10
Total marks	= 50