VISION:

To emerge as a Centre of excellence in the field of Quality Engineering and Management where the world class practices of teaching, learning and research synergize.

MISSION:

- Development of state of the art curriculum to meet the dynamic industry needs.
- Knowledge dissemination through student centric teaching learning process.
- Enriching laboratories with modern facilities
- Research contribution in the field of Quality Engineering and Management
- Maintaining continuous interaction with industry
- Cultivate the spirit of Entrepreneurship.
1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. To prepare students to excel in research or to succeed in Quality engineering and Management profession through global, rigorous post graduate education.

II. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve quality engineering problems.

III. To train students with good scientific and engineering knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.

IV. To inculcate students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate quality engineering issues to broader social context.

V. To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Quality Engineering and Management Graduates will exhibit ability to:

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<tr>
<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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<td>Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
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<td>Conduct investigations of complex problems</td>
<td>Conduct experiments &amp; collect, analyze and interpret the data.</td>
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<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>Ethics</td>
<td>Interaction industry, business and society in a professional and ethical manner.</td>
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<td>Individual and team work</td>
<td>Function in a multi-disciplinary team.</td>
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<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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3. **PROGRAM SPECIFIC OUTCOMES (PSOs):**

By the completion of Quality Engineering and Management program the student will have following Program specific outcomes.

1. To demonstrate the knowledge and understanding of Quality Engineering and Management and apply them to improve quality of products and services and achieve optimality in any organization.

2. To use the knowledge of Quality Engineering and Management to design and develop quality management system and environmentally sustainable system to fulfill the needs of society.

3. Graduates should be able to design and develop enterprises and establish themselves as successful entrepreneurs.

4. Graduates should be able to design and manage systems, processes and operations of different sectors of economy.

4. **PEO / PO Mapping:**

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* Audit Course is optional.

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### UNIVERSITY DEPARTMENTS
#### REGULATIONS - 2019
##### CHOICE BASED CREDIT SYSTEM
#### M.E. QUALITY ENGINEERING AND MANAGEMENT (PT) CURRICULUM AND SYLLABUS

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* Audit Course is optional.

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AUDIT COURSES (AC)
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OBJECTIVES:
- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives.
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using suitable test statistics which follows standard sampling distributions.
- To establish a relationship that make it possible to predict one or more variable in terms of others using correlation and regression analysis.
- To introduce the various experimental designs and their corresponding analysis of variance which play vital role in many real time scenarios.
- To impart knowledge of handling random vectors which represent random variables in multi-dimensional space.

UNIT I ESTIMATION THEORY
12

UNIT II TESTING OF HYPOTHESIS
12
Tests based on Normal, $t$, $\chi^2$ and $F$ distributions for testing of means, variance and proportions – Analysis of $r \times c$ tables – Goodness of fit.

UNIT III CORRELATION AND REGRESSION
12
Multiple and Partial Correlation - Method of Least Squares- Plane of Regression - Properties of Residuals - Coefficient of Multiple Correlation - Coefficient of Partial Correlation - Multiple Correlation with total and partial correlations - Regression and Partial correlations in terms of lower order coefficients.

UNIT IV DESIGN OF EXPERIMENTS
12
Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT V MULTIVARIATE ANALYSIS
12

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students will be able to
- Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
- Use various test statistics in hypothesis testing for mean and variances of large and small samples.
- Determine the regression line using the method of least square and also to calculate the partial and multiple correlation coefficient for the given set of data points.
- Test the hypothesis for several means using one way, two way or three way classifications.
- Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:
OBJECTIVES
- To provide students the knowledge of optimization techniques and approaches. Formulate a real-world problem as a mathematical model and finding solutions
- To enable the students to learn about revised simplex method and sensitivity analysis of LPP.
- To solve networking problems like transportation, Assignment, Maximal flow, Minimum spanning tree and shortest path problems
- To learn about Decision making under uncertainty and certainty conditions.
- To learn various Queuing models

UNIT I  LINEAR PROGRAMMING  12

UNIT II  ADVANCES IN LINEAR PROGRAMMING  12

UNIT III  NETWORK ANALYSIS  12

UNIT IV  DECISION AND GAME THEORY  12
Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis –Introduction to MCDM; AHP. Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP

UNIT V  QUEUING THEORY  12
Queuing theory terminology – Single server, multi server- limited and unlimited queue capacity- limited and unlimited population.

TOTAL: 60 PERIODS

OUTCOMES
CO1: Learned how to translate a real-world problem, given in words, into a mathematical formulation
CO2: Learn to apply simplex algorithm for LPP.
CO3: Be able to build and solve Transportation Models and Assignment Models, maximal flow problem, minimum spanning tree and shortest path problem.
CO4: The students will be able to handle issues in Decision making under various conditions.
CO5: The students acquire capability in applying and using of queuing models for day today problems.

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QE5101 MEASUREMENT SYSTEMS

OBJECTIVES:
- Describe the principles of engineering tribology.
- Summarize the metrology of surface finish.
- Relate computer in measurement/industrial inspectionsystems.
- Contrast the corrosion types and its testing methods.
- Describe the principle and standards of destructive and non destructive testing.

UNIT I  
FRICITION AND WEAR MEASUREMENT  

UNIT II  
SURFACE FINISH & VIDEO MEASUREMENT SYSTEMS  

UNIT III  
COMPUTER AIDED METROLOGY  
Computer Aided Metrology - principles and interfacing, soft metrology - application of lasers in precision measurements - laser interface, laser scanners, Coordinate Measurement Machine (CMM), types of CMM & applications. CMM software, scanning, reverse engineers applications, performance evaluation of coordinate measuring machines, possible sources of error in CMM.

UNIT IV  
MEASUREMENT OF CORROSION  
Introduction – types- definition and principles. Purpose of corrosion testing - corrosion testing equipments – susceptibility tests for intergranular corrosion - Stress corrosion test. Salt spray test humidity and porosity tests, accelerated weathering tests, ASTM standards for corrosion testing.

UNIT V  
DESTRUCTIVE AND NON DESTRUCTIVE TESTING  

TOTAL: 60 PERIODS

OUTCOMES: At the end of the course the students will be able to learn about:
CO1: The principles of engineering tribology and the procedures for performing tribological tests.
CO2: The fundamentals of metrology of surface finish.
CO3: The applications of computer in measurement/inspection system.
CO4: The various types of corrosion, effects and testing methods.
CO5: The principles and procedure of destructive and non destructive testing.
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RM5151 RESEARCH METHODOLOGY AND IPR L T P C

COURSE OBJECTIVES:
To impart knowledge and skills required for research and IPR:
• Problem formulation, analysis and solutions.
• Technical paper writing / presentation without violating professional ethics
• Patent drafting and filing patents.

UNIT I RESEARCH PROBLEM FORMULATION
Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II LITERATURE REVIEW
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III TECHNICAL WRITING /PRESENTATION
Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR)
Traditional knowledge Case Studies, IPR and IITs.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.
OBJECTIVES:

- Summarize the applications of measurement sensors and actuators.
- Correlate heat treatment and its effects on materials.
- Develop specimens for microstructure analysis.
- Use of tribological test for wear and friction assessment of different materials.
- Contrast the corrosion and surface roughness of different materials.

LIST OF EXPERIMENTS

1. Study of measurement sensors and actuators.
2. Effect of ultra-sonication on the properties of castings.
4. Preparation of specimen for microstructure analysis.
5. Analysis of microstructure using optical microscope.
6. Determination of friction and wear characteristics at dry and wet conditions.
7. Determination of friction and wear characteristic at elevated conditions.
8. Measurement of surface roughness on different work samples.
9. Determination of pH values for various concentration of a given solutions.
10. Measurement of corrosion on different materials.

LIST OF EQUIPMENTS:

1. Ultra-sonication assisted casting Setup.
2. High temperature furnace.
3. Moulding machine.
4. Polishing machine.
5. Optical microscope.
7. Pin-on-disc Tribometer.
8. Surface roughness meter.
9. pH meter.
10. Salt spray corrosion tester.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, students should be able to:

CO1: Demonstrate the necessary skills to collect data and interpret results.
CO2: Perform the heat treatment on materials to assess the thermal effects.
CO3: Prepare specimen and perform microstructural characterization.
CO4: Perform the tribological test at different conditions.
CO5: Analyse the corrosion behaviour of various materials.
OBJECTIVES:
- Provide adequate exposure to applications of optimization software packages for solving Operations Research problems.
- Learn to solve Linear programming problems using Excel.
- Summarize the problem solving techniques writing algorithms and procedures.
- Illustrate the syntax and semantics for C programming language.
- Develop the C code for simple logic.

LABORATORY EXPERIMENTS
1. LP Models formulation and solving using optimization software.
2. Formulation of Transportation Problem and solving using optimization software.
3. Formulation of Assignment Problems and solving using optimization software.
5. Solving Minimal Spanning Tree problems using optimization software.
7. Solving Project Management problems using optimization software.
8. Solving Waiting line problems using optimization software.
9. Solving two players zero sum game using optimization software.
10. Solving LPP using Microsoft EXCEL.

SOFTWARE REQUIREMENTS:
Optimization software

OUTCOMES:
CO1: Acquire knowledge in using Optimization software Package
CO2: Acquired knowledge using excel to solve LPP
CO3: Ability to write the algorithms for optimization problems.
CO4: Learned various syntax of C programme.
CO5: Ability to develop C ++programming for solving optimization problem.
OBJECTIVES:

- Impart basic knowledge on quality loss function and design of experiments
- Inculcate knowledge in single and factorial experiments
- Provide insights on orthogonal experiments
- Describe the concepts in robust design
- Provide exposure on response surface methods and shainin DOE

UNIT I INTRODUCTION
Perception of quality, Taguchi’s definition of quality – quality loss function, Planning of experiments, design principles, terminology, normal probability plot, Analysis of variance, Linear regression models.

UNIT II FACTORIAL EXPERIMENTS
Design and analysis of single factor and multi-factor experiments, tests on means, EMS rules. 2^K Factorial designs, Fractional factorial designs, Nested designs, Blocking and Confounding.

UNIT IV ORTHOGONAL EXPERIMENTS
Selection of orthogonal arrays (OA’s), OA designs, conduct of OA experiments, data collection and analysis of simple experiments, Modification of orthogonal arrays.

UNIT V ROBUST DESIGN
Variability due to noise factors, Product and process design, Principles of robust design, objective functions in robust design - S/N ratios, Inner and outer OA experiments, optimization using S/N ratios, fraction defective analysis, case studies.

UNIT V RESPONSE SURFACE METHODS AND SHAININ DOE

TOTAL: 60 PERIODS

OUTCOMES:
Students should be able to:

CO1 – Get an introduction about various quality design principles, methods and terminologies
CO2 – Effectively design and analyze factorial experiments
CO3 – Apply and analyze orthogonal experiments while designing quality of the system
CO4 – Understand the concepts in robust design procedures
CO5 – Gain knowledge on response surface methods and tools in shainin DOE

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REFERENCES:
OBJECTIVES:

- Summarize the Overview of Quality
- Illustrate the essentials of Quality
- Understand and apply Selected Quality Improvement techniques
- Interpret the concepts and application of TPM, Reliability and FMEA
- Develop comprehensive knowledge on Quality Management Systems and awards

UNIT I INTRODUCTION
9+3=12

UNIT II ESSENTIALS OF QUALITY MANAGEMENT
9+3=12
Leadership - Desirable Qualities of a Leader - Role of Leaders in Quality improvement; Customer focus – Steps of developing customer focus – Customer and management – Factors affecting customer satisfaction – Importance of customer retention – Employee Involvement - Motivation - Empowerment - Teams - Rewards and Recognition - Performance appraisal - Quality circles

UNIT III QUALITY IMPROVEMENT TECHNIQUES
9+3=12
Continuous process improvement - The Juran Trilogy - Improvement strategies - The PDSA Cycle - Kaizen - Six- Sigma - Bench Marking – Cost of Quality – Quality function Deployment - The role of Information Technology in Quality improvement.

UNIT IV TOTAL PRODUCTIVE MAINTENANCE (TPM) 9+3=12

UNIT V QUALITY MANAGEMENT SYSTEMS AND AWARD
9+3=12

TOTAL: 60 PERIODS

OUTCOMES:

CO1 – Recognition of importance of Quality
CO2 – Acquiring essentials of Quality
CO3 – Application of Quality Improvement tools
CO4 – Machine effectiveness and Reliability
CO5 – Comprehensive Quality Management System

REFERENCES:
OBJECTIVES

- Developing a clear knowledge in the basics of various quality concepts.
- Facilitating the students in understanding the application of control charts and its techniques.
- Developing the special control procedures for service and process oriented industries.
- Analyzing and understanding the process capability study.
- Developing the acceptance sampling procedures for incoming raw material.

UNIT I  INTRODUCTION

UNIT II  CONTROL CHARTS
Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables- X, R and S charts, attribute control charts - p, np, c and u- Construction and application.

UNIT III  SPECIAL CONTROL PROCEDURES
Warning and modified control limits, control chart for individual measurements, multi-vari chart, X chart with a linear trend, chart for moving averages and ranges, cumulative-sum and exponentiallyweighted moving average control charts.

UNIT IV  STATISTICAL PROCESS CONTROL
Process stability, process capability analysis using a Histogram or probability plots and control chart.Gauge capability studies, setting specification limits.

UNIT V  ACCEPTANCE SAMPLING
The acceptance sampling fundamental, OC curve, sampling plans for attributes, simple, double, multiple and sequential, sampling plans for variables, MIL-STD-105D and MIL-STD-414E & IS2500 standards.

TOTAL: 60 PERIODS

OUTCOMES:

Students will be able to:
CO1: Control the quality of processes using control charts for variables in manufacturing industries.
CO2: Control the occurrence of defective product and the defects in manufacturing companies.
CO3: Control the occurrence of defects in services.
CO4: Analyzing and understanding the process capability study.
CO5: Developing the acceptance sampling procedures for incoming raw material.

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3. IS 2500 Standard sampling plans.
OBJECTIVES
- To get hands on training and exposure on descriptive and Inferential statistics, Hypothesis testing, Regression and Correlation Analysis.
- To get hands on training and exposure on Factor Analysis, Discriminant Analysis and Cluster Analysis.
- To get hands on training and exposure to techniques on Single factor experiments, Factorial experiments and $2^K$ design.
- To get hands on training and exposure on design and Analysis of Taguchi’s DOE
- To get hands on training on Response Surface Methodology and MANOVA.

EXPERIMENTS
- Statistical analysis: Descriptive Statistics • Inferential statistics
- Testing of Hypothesis
- Linear Regression and Correlation
- Discriminant analysis
- Control charts
- Process capability
- Single Factor Experiments
- Factorial experiments
- $2^K$ Design
- Analysis of Variance (ANOVA)
- Taguchi Design of Experiments
- Factor analysis
- Cluster Analysis
- Response Surface Method
- MANOVA

TOTAL: 60 PERIODS

OUTCOMES:
CO1: Ability to compute descriptive and inferential statistics, Hypothesis testing, Regression and Correlation Analysis for a given data using Excel/ Python/ Minitab software.
CO2: Ability to perform Factor Analysis, Discriminant Analysis, Cluster Analysis and develop Process control using Excel/ Python/ Minitab software.
CO3: Ability to perform DOE (Single, Factorial and $2^K$ design) for a given data using Excel/ Python/ Minitab software.
CO4: Ability to perform Taguchi Design using Excel/ Python / Minitab software
CO5: Ability to perform Response Surface Methodology and MANOVA for a given data using Excel/ Python/ Minitab software.

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TOTAL: 60 PERIODS
OBJECTIVES:
- Gain knowledge of innovation in Product design and development.
- Summarize the development of new products through conceptualization, design and development phases.
- Associate various aspects of product development with industrial design and manufacturing.
- Interpret the fundamental concept of Rapid Prototyping.
- Generate products which are suitable for the needs of the society.

UNIT I PRODUCT DEVELOPMENT AND CONCEPT SELECTION

UNIT II PRODUCT ARCHITECTURE
Product architecture – Implication of the architecture – Establishing the architecture – Related system level design issues.

UNIT III INDUSTRIAL AND MANUFACTURING DESIGN
Need for industrial design – Impact of industrial design – Industrial design process. Assessing the quality of industrial design- Human Engineering consideration -Estimate the manufacturing cost – Reduce the component cost – Reduce the assembly cost – Reduce the support cost – Impact of DFM decisions on other factors

UNIT IV PROTOTYPING AND ECONOMIC ANALYSIS

UNIT V MANAGING PRODUCT DEVELOPMENT PROJECTS
Sequential, parallel and coupled tasks - Baseline project planning – Project Budget- Project execution – Project evaluation- patents- patent search-patent laws-International code for patents.

TOTAL: 45 PERIODS

OUTCOMES:
- CO1: The students should be able to understand the basic concept of product development.
- CO2: Design and develop new products in a systematic using the studied tools and techniques.
- CO3: To associate various aspects of product development with industrial design and manufacturing.
- CO4: To understand the fundamental concept of Rapid Prototyping.
- CO5: To be able to design products which are suitable for the needs of the society.

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REFERENCES:
QUALITY AUDITS FOR IMPROVED PERFORMANCE

OBJECTIVES:
- Understand Various Auditing Process
- Prepare and Manage the Audit Program
- Perform Auditing and Reporting
- Follow Up Audit Procedure and Perform Closure of Audit Procedures.
- Perform Process Based Auditing

UNIT I - INTRODUCTION

UNIT II - AUDIT PROGRAM MANAGER AND PREPARATION
Accountability – Resources for audit program – Phases of audit – The audit team – Second rule of auditing – Authority – Requirements – Understand the process – Audit Plan – Evaluate documents

UNIT III - PERFORMANCE AND REPORTING

UNIT IV - FOLLOW UP AND CLOSURE

UNIT V - PROCESS BASED AUDITING
The process approach – Auditing process based Quality Management System – Audit program management – The process of Auditing – Audit reporting phase – Audit closure phase

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Able to Understand Various Auditing Process
CO2: Able to Prepare and Manage the Audit Program
CO3: Able to Perform Auditing and Reporting
CO4: Able to Follow Up Audit Procedure and Perform Closure of Audit Procedures.
CO5: Able to Perform Process Based Auditing

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REFERENCES:
OBJECTIVES:
- Studying the basic principles and concepts in software quality
- Effectively designing, analyzing and developing the software engineering activities
- Gaining knowledge on software quality assurance and risk management
- Analyze the principles and applications of software quality management tools
- Gaining knowledge about software quality standards

UNIT I  SOFTWARE QUALITY  9
Definition of Software Quality, Quality Planning, Quality system – Quality Control Vs Quality Assurance – Product life cycle – Project life cycle models.

UNIT II  SOFTWARE ENGINEERING ACTIVITIES  9

UNIT III  SUPPORTING ACTIVITIES  9
Metrics, Reviews –SCM – Software quality assurance and risk management.

UNIT IV  SOFTWARE QUALITY MANAGEMENT TOOLS  9
Seven basic Quality tools – Checklist – Pareto diagram – Cause and effect diagram – Run chart – Histogram – Control chart – Scatter diagram – Poka Yoke – Statistical process control – Failure Mode and Effect Analysis – Quality Function deployment – Continuous improvement tools – Case study.

UNIT V  QUALITY ASSURANCE MODELS  9

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – understand the basic principles and concepts in software quality
CO2 – effectively design, analyze and develop software engineering activities
CO3 – gain knowledge on software quality assurance and risk management
CO4 – understand the principles and applications of software quality management tools
CO5 – gain knowledge about software quality standards

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REFERENCES:
OBJECTIVES:

- Explain the fundamentals of C++
- To introduce the object oriented programming
- To learn how to create a class in C++
- Articulate how to derive a class
- Design the object oriented programming for Industrial Problems

UNIT I C++ BASICS

Expression and statements, operators, precedence, type conversion, control statements, loops, Arrays structures, functions, argument passing, reference argument, overloaded function.

UNIT II FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING

Elements of OOP, classes, subjects, messaging, inheritance, polymorphism, OOP paradigm versus procedural paradigm, object-oriented design.

UNIT III C++ CLASS

Definition, class objects, member functions, class argument, operator overloading, user defined conversions.

UNIT IV CLASS DERIVATION

Derivation specification, public and private base classes, standard conversions under derivation, classsscope, initialization and assignment under derivation.

UNIT V APPLICATION

OOP’s applications in Industrial Engineering.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to and write and execute C++ programs,
CO2: Able to understand the need for object oriented programming
CO3: Able to create class in C++ program
CO4: Able to derive a class from the basic class
CO5: Able to write a program for solving the industrial problem.

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REFERENCES:

OBJECTIVES:
- Summarize the operations, its strategy and Design.
- Forecast the future demand with accuracy.
- Plan the production and its resources.
- Illustrate the Inventory and its control.
- Interpret the control of production.

UNIT I  INTRODUCTION TO OPERATIONS AND ITS DESIGN

UNIT II  FORECASTING
Forecasting as a planning tool, need for forecast, forecasting time horizon, Design of forecasting system, Developing the forecasting Logic, Sources of data, Models for forecasting, Explorative Methods using Time Series - Moving averages, The exponential smoothing method, Extracting the components of time series, Estimating the trend using linear regression and Extracting the seasonal component; Causal Methods of forecasting, Accuracy of Forecasts and using the Forecasting System.

UNIT III  PRODUCTION PLANNING
Aggregate Production Planning and Master Production Scheduling; Resources Planning – Dependent demand attributes, the basic building blocks of a planning frame work, MRP logic, Using the MRP system, Capacity Requirements (CRP), Distribution Requirement Planning (DRP), and Resources Planning; Manufacturing Resources Planning (MRP II), Enterprise Resource Planning (ERP) and Resources Planning in Services.

UNIT IV  INVENTORY MANAGEMENT AND CONTROL
Inventory planning for independent Demand items, Types of inventory, Inventory Costs, Inventory Control for Deterministic Demand items, Handling Uncertainty in Demand, Inventory Control Systems, Selective Control of Inventory, Inventory Planning for Single - Period Demand and other issues in Inventory Planning and Control.

UNIT V  CAPACITY MANAGEMENT AND OPERATIONAL CONTROL
Defining capacity, Measures of capacity, The time horizon in capacity planning, The capacity planning framework, Alternatives for capacity augmentation, Decision tree for capacity planning; Operational control – Input - Output Control, Operational Control issues in mass production systems and Operations planning and control based on the theory of constraints; Elements of JIT Manufacturing and Production planning and Control in JIT.

TOTAL: 45 PERIODS

OUTCOMES:
CO1: The students will be able to understand what is operations management, its strategies and design of operations.
CO2: The students will be able to apply various techniques in forecasting the future Demand with accuracy.
CO3: The students will be able to plan the production schedule and apply techniques like Aggregate plan, MRP, MRP II, DRP and ERP.
CO4: The students will be able determine the lot size and understand the inventory systems. Also will be able to classify the inventories for a better control.
CO5: The students will be able to understand capacity planning and exercise control on production. Also understand JIT implementation and control.
IL5082 RELIABILITY ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:
- Impart knowledge in reliability concepts.
- Facilitate students in filling the life data into theoretical distribution.
- Educate the students in reliability evaluation of various configuration.
- Impart knowledge in reliability monitoring methods.
- Analyze effectively various techniques to improve reliability of the system.

UNIT I RELIABILITY CONCEPTS

UNIT II LIFE DATA ANALYSIS

UNIT III RELIABILITY ASSESSMENT

UNIT IV RELIABILITY MONITORING

UNIT V RELIABILITY IMPROVEMENT

OUTCOMES:
CO1 – understand the basic concepts of reliability engineering
CO2 – effectively analyze various non parametric methods and failure distributions
CO3 – conduct reliability assessment and failure analysis on any complex systems
CO4 – effectively design and analyze reliability monitoring techniques
CO5 – analyze various techniques to improve reliability of the system
IL5073  DECISION SUPPORT SYSTEMS  L T P C  3 0 0 3

OBJECTIVES:
- Summarize managerial role in decision making.
- Articulate insights in the models used for decision making
- Interpret knowledge management methods
- Relate knowledge acquisition and representation.
- Discover the issues in implementation of decision making systems.

UNIT I  DECISION MAKING  9
Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.

UNIT II  MODELING AND ANALYSIS  9
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III  KNOWLEDGE MANAGEMENT  9
Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.

UNIT IV  INTELLIGENT SYSTEMS  9
Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation, knowledge representation

UNIT V  IMPLEMENTATION  9
Implementation, integration and impact of management support systems.

TOTAL : 45 PERIODS

OUTCOMES:
CO1 – Make decisions in the semi structured and unstructured problem situations using systems and semantic networks.
CO2 – Understand various components of DSS and modeling & analysis phases of DSS
CO3 – Understand the concepts of knowledge management methods in DSS
CO4 – Gain knowledge on artificial intelligence systems
CO5 – Implement management support systems

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REFERENCES:
OBJECTIVES:
- Explain about generating of random numbers and random variates.
- Teach how to test the random numbers and random variates.
- Illustrate how to design the simulation experiment.
- Develop to be trained in simulation software packages.
- Apply simulation techniques for various optimization problems.

UNIT I INTRODUCTION TO DISCRETE EVENT SYSTEM SIMULATION

UNIT II STATISTICAL MODELS IN SIMULATION AND RANDOM NUMBER AND TESTING

UNIT III RANDOM VARIATE GENERATION AND TESTING

UNIT IV VERIFICATION AND VALIDATION OF SIMULATION MODELS
Model Building- Verification and Validation – Face validity – Validation Input- Output Transformations – Input –Output Validation: Using a Turing Test- Monte Carlo simulation- Simulation Experiments

UNIT V SIMULATION LANGUAGES AND CASE STUDIES
Simulation in C++ - Simulation in GPSS – Simulation with software packages – waiting line models – Inventory models

TOTAL : 45 PERIODS

OUTCOMES:
CO1: Able to understand the Discrete event system simulation
CO2: Able to generate random numbers and test statistically.
CO3: Able to generate random variate and test statistically.
CO4: Able to do the simulation model and validate the model.
CO5: How to use simulation software to simulate and analyse various problems.

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REFERENCES:
OBJECTIVES:
- Summarize the basics of Lean and Six Sigma.
- Describe the need and the process of integrating Lean and Six sigma.
- Identify and select the resources required for LSS Projects and selection of projects including Team building.
- Infer the DMAIC process and study the various tools for undertaking LSS projects.
- Relate how to institutionalize the LSS efforts.

UNIT I INTRODUCTION TO LEAN AND SIX SIGMA

Introduction to Lean- Definition, Purpose, Features of Lean ; Top seven wastes, Need for Lean management, The philosophy of lean management, Creating a lean enterprise, Elements of Lean, Lean principles, the lean metric, Hidden time traps. Introduction to quality, Definition of six sigma, origin of six sigma, Six sigma concept and Critical success factors for six sigma; Case analysis.

UNIT II INTEGRATION OF LEAN AND SIX SIGMA

Evolution of lean six sigma, the synergy of Lean and six sigma, Definition of lean six sigma, the principles of lean six sigma, Scope for lean six sigma, Features of lean six sigma. The laws of lean six sigma, Key elements of LSS, the LSS model and the benefits of lean six sigma. Initiation - Top management commitment – Infrastructure and deployment planning, Process focus, organizational structures, Measures – Rewards and recognition, Infrastructure tools, structure of transforming event and Launch preparation; Case study presentations.

UNIT III PROJECT SELECTION AND TEAM BUILDING

Resource and project selection, Selection of Black belts, Training of Black belts and Champions, Identification of potential projects, top down (Balanced score card) and Bottom up approach – Methods of selecting projects – Benefit/Effort graph, Process mapping, value stream mapping, Predicting and improving team performance, Nine team roles and Team leadership; Case study presentations.

UNIT IV THE DMAIC PROCESS AND TOOLS

The DMAIC process – Toll gate reviews; The DMAIC tools; Define tools – Project definition form, SIPOC diagram; Measure tools – Process mapping, Lead time/cycle time, Pareto chart, Cause and Effect matrix, FMEA; Idea – generating and organizing tools – Brainstorming, Nominal group technique, Multi-voting and Cause and effect diagram, Data collection and accuracy tools- Check sheet, Gauge R&R; Understanding and eliminating variation- run charts, control charts and process capability analysis; Analyze tools - Scatter plots, ANOVA, Regression analysis, Time trap analysis; Improve tools – Mistake proofing, Kaizen, set up time reduction (SMED), TPM, DOE and the pull system. Control tools – statistical process control.

UNIT V INSTITUTIONALIZING AND DESIGN FOR LSS

Institutionalizing lean six sigma – improving design velocity, creating cycle time base line, valuing projects, gating the projects, reducing product line complexity, Design for lean six sigma, QFD, Theory of Inventive Problem solving (TRIZ), Robust design; Case study presentations.

TOTAL : 45 PERIODS

OUTCOMES:
- CO1: The students will be able to understand what is Lean and Six sigma and their importance in the globalised competitive world.
- CO2: The students will be able to understand the importance of integrating Lean and Six sigma and also the process of their integration.
- CO3: The students will be able to plan the Resources required to undertake the LSS projects and also acquire how to select the suitable projects and the teams.
- CO4: The students will be able apply DMAIC methodology to execute LSS projects and in this regard they will be acquainted with various LSS tools.
- CO5: The students will be able to understand the process of institutionalizing the LSS effort and also understand the Design for LSS.
REFERENCES:

QE5004 PRODUCT DESIGN AND VALUE ENGINEERING

OBJECTIVES:
- Gain knowledge of product development integrated with value engineering.
- Summarize the development of new products through conceptualization, design and development phases.
- To associate various aspects of product development with industrial design and manufacturing.
- Check the value of a product using tools and techniques.
- Generate products which are suitable for the needs of the society.

UNIT I VALUE ENGINEERING BASICS
Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity in Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS
Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

UNIT III IDENTIFYING CUSTOMER NEEDS and PRODUCT SPECIFICATIONS

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE

UNIT V INDUSTRIAL DESIGN, PROTOTYPING AND ECONOMICS OF PRODUCT DEVELOPMENT
Need for industrial design – Impact of industrial design – Industrial design process – Management of industrial design process – Assessing the quality of industrial design.

TOTAL: 45 PERIODS

OUTCOMES:
Student will be able to:
- CO1: To understand the basic concept of product development integrated with value engineering.
- CO2: Design new products in a systematic manner considering the concept of value engineering.
- CO3: To associate various aspects of product development with industrial design and manufacturing.
- CO4: To practically access the value of a product using tools and techniques.
- CO5: To be able to design products which are suitable for the needs of the society.
REFERENCES:

IL5079 MANAGEMENT ACCOUNTING AND FINANCIAL MANAGEMENT

OBJECTIVES:
- Preparing the P&L A/C, Balance sheet and other accounting
- Applying the various cost accounting methods
- Sketch and Prepare a budget
- Evaluating and making investment decisions and select the most desirable projects
- Developing financial decision

UNIT I FINANCIAL ACCOUNTING

UNIT II COST ACCOUNTING

UNIT III BUDGETING
Requirements for a sound budget, Fixed budget — Preparation of sales and Production budget, Flexible budgets, Zero base budgeting and budgetary control.

UNIT IV FINANCIAL MANAGEMENT
Investment decisions – Capital investment process, Type of investment proposals, Investment appraisal techniques – Payback period method, Accounting rate of return, Net present value method, Internal rate of return and Profitability index method.

UNIT V FINANCIAL DECISIONS
Cost of capital – Capital structure – Dividend policy – Leasing.

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Ability to prepare P&L A/C, Balance sheet and other accounting
CO2: Ability to apply the various cost accounting methods
CO3: Ability to prepare a budget
CO4: Ability to Evaluate, make investment decisions and select the most desirable projects
CO5: Ability to make financial decision
REFERENCES

IL5251 MULTI - VARIATE DATA ANALYSIS
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OBJECTIVES:
- Understanding the basic overview on multi variate data analysis
- Predicting the values of one or more variables on the basis of observations on the other variables.
- Formulating the specific statistical hypotheses, in terms of the parameters of multi variate populations
- Data reduction or structural simplification as simply as possible without sacrificing valuable information and will make interpretation easier.
- Sorting and Grouping "similar" objects or variables are created, based upon measured characteristics.

UNIT I REGRESSION
Simple Regression and Correlation – Estimation using the regression line, Correlation analysis, Multiple regression and Correlation analysis – Finding the Multiple Regression equation, Modelling techniques, Making inferences about the population parameters.

UNIT II MULTIVARIATE METHODS
An overview of Multivariate methods, Multivariate Normal distribution, Eigen values and Eigen vectors.

UNIT III FACTOR ANALYSIS

UNIT IV DISCRIMINANT ANALYSIS

UNIT V CLUSTER ANALYSIS
Cluster analysis – Clustering methods, Multivariate analysis of Variance.

TOTAL : 45 PERIODS

OUTCOMES:
CO1: To understand the basic overview on multi variate data analysis
CO2: Predict the values of one or more variables on the basis of observations on the other variables.
CO3: Formulate the specific statistical hypotheses, in terms of the parameters of multi variate populations
CO4: Data reduction or structural simplification as simply as possible without sacrificing valuable information and will make interpretation easier.
CO5: Sorting and Grouping "similar" objects or variables are created, based upon measured characteristics.

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QE5005 MULTI-CRITERIA DECISION MAKING

UNIT I INTRODUCTION TO MCDM METHODS

UNIT II ANALYTIC HIERARCHY PROCESS AND ANALYTIC NETWORK PROCESS

UNIT III OUTRANKING MCDM METHODS

UNIT IV ADVANCES IN MCDM

UNIT GOAL PROGRAMMING AND BALANCED SCORECARD APPROACH
Goal Programming – Balanced Scorecard Approach - MCDM application areas – Case studies on application of MCDM techniques.

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to:
CO1 : Understand the importance of Multi-Criteria Decision Making problems in real life applications.
CO2 : Apply AHP and ANP to solve MCDM problems.
CO3 : Effectively apply various outranking MCDM methods to solve real time problems.
CO4 : Effectively apply Fuzzy and Hybrid MCDM methods for effective decision making.
CO5 : Understand the principles of Goal programming and balanced scorecard approach in solving real time problems.

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REFERENCES:
QE5006  ENGINEERING ECONOMICS AND COSTING  

OBJECTIVES:

- Understanding the concept of Engineering Economics and apply in the real word.
- Gaining knowledge in the field of value engineering to enable the students to estimate the costing factors
- Understand the concept of cash flow and its methods of comparison
- Acquire knowledge in the field of cost estimation
- Enable the students to estimate the cost of various manufacturing processes.

UNIT I  INTRODUCTION TO ECONOMICS  

UNIT II  VALUE ENGINEERING  
Interest formulae and their applications – Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III  CASH FLOW  
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV  PROFIT ANALYSIS  
The concept of profit: Profit planning, control and measurement of profits. Profit maximisation – Cost volume profit analysis – Investment Analysis.

UNIT V  COSTING  
Job costing-Process costing-Operating costing-Standard Costing (variance analysis) and budgeting.

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1 : Understand the principles and fundamentals of Engineering economics
CO2 : Gain knowledge on value engineering concepts
CO3 : Analyze cash flow and methods of pricing decisions
CO4 : Students will become familiar with principles of cost estimation.
CO5 : Able to apply these principles to appreciate the functioning of product and input market as well as the economy

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TEXT BOOK:
OBJECTIVES:

- Explain to students about the Scheduling techniques, algorithms, and Heuristics that are applied for operations management.
- Cite the basic scheduling concepts.
- Illustrate machine model concepts in scheduling.
- Interpret the flow shop model concepts and algorithms.
- Develop knowledge on job shop modeling concepts.

UNIT I  SCHEDULING BASICS

UNIT II  SINGLE MACHINE MODEL

UNIT III  PARALLEL MACHINE MODEL

UNIT IV  FLOW SHOP MODEL

UNIT V  JOB SHOP MODEL

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1 : Understand the basic scheduling concepts
CO2 : Effectively gain knowledge on single machine model concepts
CO3 : Analyze parallel machine model concepts in scheduling
CO4 : Understand the flow shop model concepts and algorithms
CO5 : Gain knowledge on job shop modeling concepts

REFERENCES:
OBJECTIVES:
- Explain the role of supply chain management in an organization.
- Identify the various aspects of supply chain management and the factors affecting them.
- Explain the relationship among various factors involved in planning, organising and controlling supply chain operations.
- Summarize the sourcing and inventory decisions involved in supply chain operations.
- Explain the use of information technology in supply chain management.

UNIT I INTRODUCTION SUPPLY CHAIN MANAGEMENT
Introduction, Types of supply chains with and examples, Evolution of SCM concepts, Supply chain performance, Strategic Fit, Drivers of Supply Chain Performance – key decision areas – External Drivers of Change. Supply contracts – centralized vs. decentralized system

UNIT II SUPPLY CHAIN NETWORK DESIGN
Need for distribution network design- Factors affecting, Design options for distribution network. Network design decisions - Framework, factors influencing, Models of facility location and capacity allocation. Role of Transportation in supply chain, modes of transportation Modal Selection, Classification of carriers, Carrier Selection, Transportation Execution and Control. Food Mile Concept., design options.

UNIT III DEMAND AND SUPPLY IN SUPPLY CHAIN

UNIT IV SOURCING AND INVENTORY DECISIONS IN SUPPLY CHAIN
Purchasing Vs Procurement Vs Strategic Sourcing, Item procurement importance matrix, Strategic Sourcing Methodology, Managing sourcing and procurement process, Supplier selection and evaluation, Bullwhip effect and its management, Economies of scale in supply chain- Cycle inventory, Estimation, Quantity discounts, Multiechelon cycle inventory. Uncertainty in supply chain- Safety inventory, Determination of appropriate level, Impact on uncertainty.

UNIT – V SUPPLY CHAIN AND INFORMATION SYSTEMS

OUTCOMES:
Students will be able to:
CO1: To introduce the concepts and elements of supply chain management.
CO2: to understand supply chain network design aspects for various manufacturing and service sectors.
CO3: To understand the principle of demand and supply in supply chain
CO4: To gain knowledge on the sourcing and inventory decisions in supply chain.
CO5: To understand the concepts of supply chain information systems.

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IL5078 LOGISTICS AND DISTRIBUTION MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- Impart the basic knowledge on the concepts on logistics and distribution.
- Inculcate knowledge in Logistics Process, Planning and Materials Management.
- Teach the principles and activities in warehousing and storage.
- Provide knowledge on modes of transportation and international transport.
- Inculcate knowledge on performance monitoring, outsourcing and ICT application in logistics and distribution.

UNIT I CONCEPTS OF LOGISTICS AND DISTRIBUTION 9
Introduction to logistics and distribution- Integrated logistics and the supply chain- Integrated logistics and the supply chain- Customer service and logistics- Channels of distribution - Key issues an challenges for logistics.

UNIT II PLANNING FOR LOGISTICS 9
Planning framework for logistics -Logistics processes -Supply chain segmentation- Logistics network planning - Logistics management and organization - Manufacturing and materials management

UNIT III WAREHOUSING AND STORAGE 9
Principles of warehousing Storage and handling systems (palletized and non-palletized) - Order picking and replenishment- Receiving and dispatch - Warehouse design- Warehouse management and information.

UNIT IV FREIGHT TRANSPORT 9
International logistics: modal choice - Maritime transport - Air transport - Rail and intermodal transport- Road freight transport: vehicle selection, vehicle costing and planning and resourcing International transportation systems in Global perspective.

UNIT V OPERATIONAL MANAGEMENT 9
Cost and performance monitoring- Benchmarking- Information and communication technology in supply chain- Outsourcing: services and decision criteria, the selection process – Outsourcing management- Security and safety in distribution - Logistics and the environment.

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – Understand the concepts of logistics and distribution
CO2 – Effectively gain knowledge in logistics planning
CO3 – Apply and analyze various principles and concepts in warehousing and storage
CO4 – Effectively design and analyze a system of logistics for freight transport
CO5 – Understand the basic concepts in outsourcing, benchmarking and safety in distribution

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PD5351 PRODUCT LIFE CYCLE MANAGEMENT

COURSE OBJECTIVES
1. To study about the history, concepts and terminology in PLM
2. To understand the functions and features of PLM/PDM
3. To understand different modules offered in commercial PLM/PDM tools
4. To demonstrate PLM/PDM approaches for industrial applications
5. To Use PLM/PDM with legacy data bases, CAx& ERP systems

UNIT-I HISTORY, CONCEPTS AND TERMINOLOGY OF PLM
Introduction to PLM, Need for PLM, opportunities of PLM, Different views of PLM - Engineering Data Management (EDM), Product Data Management (PDM), Collaborative Product Definition Management (cPDM), Collaborative Product Commerce (CPC), Product Lifecycle Management (PLM). PLM/PDM Infrastructure – Network and Communications, Data Management, Heterogeneous data sources and applications

UNIT-II PLM/PDM FUNCTIONS AND FEATURES

UNIT-III DETAILS OF MODULES IN A PDM/PLM SOFTWARE
Case studies based on top few commercial PLM/PDM tools – Teamcenter, Windchill, ENOVIA, Aras PLM, SAP PLM, Arena, Oracle Agile PLM and Autodesk Vault.

UNIT-IV ROLE OF PLM IN INDUSTRIES
Case studies on PLM selection and implementation (like auto, aero, electronic) - other possible sectors, PLM visioning, PLM strategy, PLM feasibility study, change management for PLM, financial justification of PLM, barriers to PLM implementation, ten step approach to PLM, benefits of PLM for– business, organisation, users, product or service, process performance

UNIT-V BASICS ON CUSTOMISATION/INTEGRATION OF PDM/PLM SOFTWARE
PLM Customization, use of EAI technology (Middleware), Integration with legacy data base, CAD, SLM and ERP

TOTAL = 45 PERIODS
OUTCOMES:
On Completion of the course the student will be able to
1. Summarize the history, concepts and terminology of PLM
2. Use the functions and features of PLM/PDM
3. Use different modules offered in commercial PLM/PDM tools.
4. Implement PLM/PDM approaches for industrial applications.
5. Integrate PLM/PDM with legacy data bases, CAx& ERP systems

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IL5081 PROJECT MANAGEMENT

OBJECTIVES:
- Compare various models used in project selection.
- Define project planning, and estimate the cost involved.
- Apply network techniques for project scheduling and resource allocation.
- Summarize the information needed planning, monitoring and controlling cycle of a project.
- Recognize the values of project audit.

UNIT I STRATEGIC MANAGEMENT AND PROJECT SELECTION 9
Project selection models, Project portfolio process, Analysis under uncertainty, Project organization, Matrix organization

UNIT II PROJECT PLANNING AND COST ESTIMATION 9

UNIT III PROJECT IMPLEMENTATION 9
Scheduling: Network Techniques PERT and CPM, Risk analysis using simulation, CPM- crashing a project, Resource loading, leveling, and allocation.
UNIT IV  MONITORING AND INFORMATION SYSTEMS  9
Information needs and the reporting process, computerized PMIS, Earned value analysis, Planning-
Monitoring-Controlling cycle, Project control: types of control processes, design of control systems, control
of change and scope

UNIT V  PROJECT AUDITING  9
Construction and use of audit report, Project audit life cycle, Essentials of audit and evaluation, Varieties of
project termination, the termination process, The Final Report – A project history

OUTCOMES:
• CO1 - Understand various models used in project selection.
• CO2 - Acquire knowledge in project planning, and estimate the cost involved.
• CO3 - Prepare Project Scheduling and resource allocation.
• CO4 - Understand about planning, monitoring and controlling cycle of a project.
• CO5 - Understand the values of project audit.

REFERENCES:
1. Harold Kerzner, Project Management – A Systems Approach to Planning, Scheduling and Controlling,

IL5083  SERVICES OPERATIONS MANAGEMENT  L T P C
OBJECTIVES:
• Summarize the importance of services in competitive environment
• Describe the services design and development
• Illustrate the services performance
• Conclude decisions in services facility
• Plan operations involved in services

UNIT I  INTRODUCTION  9
Services – Importance, role in economy, service sector – growth; Nature of services –Service classification,
Service Package, distinctive characteristics , open-systems view; Service Strategy – Strategic service
vision, competitive environment, generic strategies, winning customers; Role of information technology;
stages in service firm competitiveness; Internet strategies – Environmental strategies.

UNIT II  SERVICE DESIGN  9
New Service Development – Design elements – Service Blue-printing - process structure – generic
approaches –Value to customer; Retail design strategies – store size – Network configuration ; Managing
Service Experience –experience economy, key dimensions ; Vehicle Routing and Scheduling

UNIT III  SERVICE QUALITY  9
Service Quality- Dimensions, Service Quality Gap Model; Measuring Service Quality –SERVQUAL - Walk-
through Audit; Quality service by design - Service Recovery - Service Guarantees; Service Encounter –
triad, creating service orientation, service profit chain; Front-office Back-office Interface – service
decoupling.
UNIT IV  SERVICE FACILITY  9
Service scapes – behavior - environmental dimensions – framework; Facility design – nature, objectives, process analysis – process flow diagram, process steps, simulation; Service facility layout; Service Facility Location – considerations, facility location techniques – metropolitan metric, Euclidean, centre of gravity, retail outlet location , location set covering problem

UNIT V  MANAGING CAPACITY AND DEMAND  9
Managing Demand – strategies; Managing capacity – basic strategies, supply management tactics, operations planning and control; Yield management; Inventory Management in Services– Retail Discounting Model, Newsvendor Model; Managing Waiting Lines –Queuing systems, psychology of waiting; Managing for growth- expansion strategies, franchising , globalization.  

OUTCOMES:
CO1: Able to summarize service strategies
CO2. Able to describe service network
CO3. Able to illustrate service performance using software tools
CO4. Able to locate facilities using simulation
CO5. Able to formulate inventory and queuing models.

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REFERENCES:

QE5008  MODERN MANUFACTURING MANAGEMENT CONCEPTS  L T P C  3 0 0 3

OBJECTIVES:
- Develop basic knowledge on lean manufacturing concepts.
- Inculcate knowledge in agile manufacturing principles.
- Solve and analyze various concepts in sustainable manufacturing.
- Teach the tools and techniques used in sustainable manufacturing.
- Articulate knowledge about the design, principles and challenges in industry 4.0

UNIT I  LEAN MANUFACTURING  9

UNIT II  AGILE MANUFACTURING  9
UNIT III  SUSTAINABLE MANUFACTURING  9

UNIT IV  TOOLS AND TECHNIQUES OF SUSTAINABLE MANUFACTURING  9

UNIT V  INDUSTRY 4.0:  9
Definition, Design, Principles, Challenges

OUTCOMES:
Students should be able to
CO1 – Understand the basic philosophies of lean manufacturing concepts
CO2 – Effectively gain knowledge in agile manufacturing principles
CO3 – Apply and analyze various concepts in sustainable manufacturing
CO4 – Understand the tools and techniques used in sustainable manufacturing
CO5 – Gain knowledge about the design, principles and challenges in Industry 4.0

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QE5072  MATERIALS MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- Impart knowledge on basic concepts of aggregate planning, manufacturing planning and enterprise resource planning.
- Pivot foundation in material planning concepts.
- Articulate knowledge on inventory management models.
- Educate the purchasing techniques and concepts.
- Exposure on warehouse management activities.
UNIT I  INTRODUCTION  9
Operating environment-aggregate planning-role, need, strategies, costs techniques, approaches master
scheduling-manufacturing planning and control system-manufacturing resource planning enterprise
resource planning-making the production plan.

UNIT II  MATERIALS PLANNING  9
Materials requirements planning-bill of materials-resource requirement planning-manufacturing resource
planning-capacity management-scheduling orders-production activity control-codification.

UNIT III  INVENTORY MANAGEMENT  9
Policy Decisions–objectives-control -Retail Discounting Model, Newsvendor Model; EOQ and EBQ models
for uniform and variable demand With and without shortages -Quantity discount models. Probabilistic
inventory models.

UNIT IV  PURCHASING MANAGEMENT  9
Establishing specifications-selecting suppliers-price determination-forward buying-mixed buying strategy-
price forecasting-buying seasonal commodities-purchasing under uncertainty-demand - price forecasting-
purchasing under uncertainty-purchasing of capital equipment, international purchasing

UNIT V  WAREHOUSE MANAGEMENT  9
Warehousing functions – types - Stores management-stores systems and procedures-incoming materials
control-stores accounting and stock verification-Obsolete, surplus and scrap-value analysis-material
handling-transportation and traffic management -operational efficiency productivity-cost effectiveness-
performance measurement

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1 : Understand the basic concepts of aggregate planning, manufacturing planning and enterprise
resource planning
CO2 : Effectively gain knowledge of materials planning concepts
CO3 : Design and analyze inventory management models
CO4 : Effectively understand the purchasing techniques and concepts
CO5 : Gain knowledge on warehouse management activities

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QE5071 MAINTENANCE ENGINEERING AND MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- Describe basic maintenance concepts
- Extract optimum maintenance decisions
- Illustrate the root cause for maintenance problems
- Plan the spare parts for maintenance activity
- Discover the losses and improve the Overall Equipment Effectiveness
UNIT I   MAINTENANCE CONCEPT
Maintenance definition - Maintenance objectives - Maintenance challenges – Tero Technology
Maintenance costs - Scope of maintenance department.

UNIT II   MAINTENANCE MODELS
Proactive/reactive maintenance - Maintenance policies - Imperfect maintenance - Preventive /
breakdown maintenance – Optimal PM schedule and product characteristics – Inspection decisions -
Maximizing profit - Minimizing downtime – Replacement decisions.

UNIT III MAINTENANCE QUALITY
Five zero concept – FMEA- FMECA – Root cause analysis – Repair time distribution – Analysis of

UNIT IV MAINTENANCE MANAGEMENT
Human factors – Maintenance staffing - Learning curves – Simulation – Optimal size of service facility –

UNIT V   TOTAL PRODUCTIVE MAINTENANCE
TPM philosophy – Chronic and sporadic losses – Equipment defects – Six major losses – Overall
equipment effectiveness– TPM pillars – Autonomous maintenance.

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Able to describe basic maintenance concepts.
CO2: Able to extract maintenance policies for maximizing the profit
CO3: Able to make a diagnosis of maintenance problems
CO4: Able to improve uptime of machines by effective spare parts management
CO5: Able to improve the overall Equipment Effectiveness

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1. Andrew K.S.Jardine & Albert H.C. Tsang, “Maintenance, Replacement and Reliability” Taylor and
Francis, 2006.

IL5075   HUMAN INDUSTRIAL SAFETY AND HYGIENE

OBJECTIVES:
• Identify and prevent operational hazard
• Categorize, analyze and interpret the accidents data based on various safety techniques.
• Use proper safety techniques on safety engineering and management.
• Design the system with environmental consciousness by implementing safety regulation
• Use safety management practices in Industries.
UNIT I OPERATIONAL SAFETY

UNIT II SAFETY APPRAISAL AND ANALYSIS

UNIT III OCCUPATIONAL HEALTH
Concept and spectrum of health functional units and activities of operational health service – occupational and related disease – levels of prevention of diseases – notifiable occupational diseases Toxicology Lead – Nickel, chromium and manganese toxicity – gas poisoning (such as CO, Ammonia Chlorise, So2, H2s.) their effects and prevention – effects of ultra violet radiation and infrared radiation on human system.

UNIT IV SAFETY AND HEALTH REGULATIONS

UNIT V SAFETY MANAGEMENT

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Ability to Identify and prevent operational hazard
CO2: Ability to Collect, analyze and interpret the accidents data based on various safety techniques.
CO3: Ability to Apply proper safety techniques on safety engineering and management.
CO4: Ability to design the system with environmental consciousness by implementing safety regulation
CO5: Ability to apply safety management practices in Industries.

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REFERENCES:
OBJECTIVES:
- Explain the basic principles in facilities planning and plant location
- Interpret the basic principles in facility layout design decisions through proper analysis.
- Illustrate and explain various techniques while designing a layout
- Impart knowledge in line balancing concepts to implement improved system
- Summarize the basic principles in designing, measuring and analyzing material flow to improve the efficiency of the system

UNIT I PLANT LOCATION
9
Plant location analysis – factors, costs, location decisions – Single facility location models, Multi facility location models - Mini-sum model - Mini-max model - Gravity location models, Brown & Gibbs model

UNIT II FACILITIES LAYOUT
9
Facilities requirement, need for layout study – types of layout, Systematic layout planning, Relationship diagram, Designing the product layout – Line balancing - mixed model assembly line balancing

UNIT III LAYOUT DESIGN
9
Designing the process layout - computerized layout planning procedure – ALDEP, CORELAP, CRAFT – Trends in computerized layout

UNIT IV GROUP TECHNOLOGY
9
Group technology – OPTIZ classification system - Production Flow analysis (PFA), ROC (Rank Order Clustering)

UNIT V MATERIALS HANDLING
9
Principles, unit load concept, material handling system design, handling equipment types, selection and specification, containers and packaging.

TOTAL: 45 PERIODS

OUTCOMES:
CO1: apply and evaluate appropriate location models for various facility types
CO2: effectively design and analyze various facility layouts
CO3: apply and analyze various computerized techniques while designing a layout
CO4: effectively design and analyze a layout using grouping techniques
CO5: implement smooth and cost effective system in the material handling process

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REFERENCES:
OPEN ELECTIVE COURSES (OEC)

OE5091 BUSINESS DATA ANALYTICS

COURSE OBJECTIVES:
- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS


Suggested Activities:
- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:
- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS


Suggested Activities:
- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.

Suggested Evaluation Methods:
- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE


Suggested Activities:
- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:
- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
- Quizzes on topics like sampling and probability.
UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK


Suggested Activities:
- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

Suggested Evaluation Methods:
- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

UNIT V OTHER DATA ANALYTICAL FRAMEWORKS

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

Suggested Activities:
- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

Suggested Evaluation Methods:
- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

REFERENCES:
OE5092 INDUSTRIAL SAFETY

COURSE OBJECTIVES:
- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION

UNIT IV FAULT TRACING
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment’s like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

COURSE OUTCOMES:
CO1: Ability to summarize basics of industrial safety
CO2: Ability to describe fundamentals of maintenance engineering
CO3: Ability to explain wear and corrosion
CO4: Ability to illustrate fault tracing
CO5: Ability to identify preventive and periodic maintenance

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REFERENCES:
COURSE OBJECTIVES:
- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- Solve project management problems
- Solve scheduling problems

UNIT I  LINEAR PROGRAMMING  9
Introduction to Operations Research – assumptions of linear programming problems - Formulations of linear programming problem – Graphical method

UNIT II  ADVANCES IN LINEAR PROGRAMMING  9
Solutions to LPP using simplex algorithm- Revised simplex method - primal dual relationships – Dual simplex algorithm - Sensitivity analysis

UNIT III  NETWORK ANALYSIS – I  9
Transportation problems - Northwes corner rule, least cost method, Voges’s approximation method - Assignment problem - Hungarian algorithm

UNIT IV  NETWORK ANALYSIS – II  9
Shortest path problem: Dijkstra’s algorithms, Floyds algorithm, systematic method - CPM/PERT

UNIT V  NETWORK ANALYSIS – III  9
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: To formulate linear programming problem and solve using graphical method.
CO2: To solve LPP using simplex method
CO3: To formulate and solve transportation, assignment problems
CO4: To solve project management problems
CO5: To solve scheduling problems

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OE5094  COST MANAGEMENT OF ENGINEERING PROJECTS  L T P C
3 0 0 3

COURSE OBJECTIVES:
- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution
• Develop knowledge of costing techniques in service sector and various budgetary control techniques
• Illustrate with quantitative techniques in cost management

UNIT I INTRODUCTION TO COSTING CONCEPTS
Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II INTRODUCTION TO PROJECT MANAGEMENT
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III PROJECT EXECUTION AND COSTING CONCEPTS
Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL
Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT
Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS

OUTCOMES
CO1 – Understand the costing concepts and their role in decision making
CO2–Understand the project management concepts and their various aspects in selection
CO3–Interpret costing concepts with project execution
CO4–Gain knowledge of costing techniques in service sector and various budgetary control techniques
CO5 - Become familiar with quantitative techniques in cost management

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2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988

OE5095 COMPOSITE MATERIALS

COURSE OBJECTIVES:
• Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I  INTRODUCTION  9
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II  REINFORCEMENTS  9
Preparation - layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III  MANUFACTURING OF METAL MATRIX COMPOSITES  9

UNIT IV  MANUFACTURING OF POLYMER MATRIX COMPOSITES  9

UNIT V  STRENGTH  9
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
- CO2 – Know the various reinforcements used in composite materials.
- CO3 – Understand the manufacturing processes of metal matrix composites.
- CO4 – Understand the manufacturing processes of polymer matrix composites.
- CO5 – Analyze the strength of composite materials.

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COURSE OBJECTIVES:
- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations
Invent knowledge on biomass combustors and its applications on generating energy
Summarize the principles of bio-energy systems and their features

UNIT I  INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE  9
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II  BIOMASS PYROLYSIS  9
Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III  BIOMASS GASIFICATION  9

UNIT IV  BIOMASS COMBUSTION  9
Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT V  BIO ENERGY  9
Properties of biogas (Calorific value and composition), Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production -Urban waste to energy conversion - Biomass energy programme in India.

OUTCOMES:
CO1 – Understand the various types of wastes from which energy can be generated
CO2 – Gain knowledge on biomass pyrolysis process and its applications
CO3 – Develop knowledge on various types of biomass gasifiers and their operations
CO4 – Gain knowledge on biomass combustors and its applications on generating energy
CO5 – Understand the principles of bio-energy systems and their features

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AUDIT COURSES (AC)

AX5091  ENGLISH FOR RESEARCH PAPER WRITING  L T P C
2 0 0 0

COURSE OBJECTIVES:
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
• Summarize the skills needed when writing a Title
• Infer the skills needed when writing the Conclusion
• Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

UNIT III TITLE WRITING SKILLS 6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

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AX5092 DISASTER MANAGEMENT

COURSE OBJECTIVES:
• Summarize basics of disaster
• Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
• Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
• Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
• Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS

UNIT III DISASTER PRONE AREAS IN INDIA
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

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AX5093 SANSKRIT FOR TECHNICAL KNOWLEDGE

COURSE OBJECTIVES:
• Illustrate the basic sanskrit language.
• Recognize sanskrit, the scientific language in the world.
• Appraise learning of sanskrit to improve brain functioning.
• Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
• Extract huge knowledge from ancient literature.

UNIT I ALPHABETS
Alphabets in Sanskrit

6

UNIT II TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences

6

UNIT III ORDER AND ROOTS
Order - Introduction of roots

6

UNIT IV SANSKRIT LITERATURE
Technical information about Sanskrit Literature

6

UNIT V TECHNICAL CONCEPTS OF ENGINEERING
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

6

TOTAL: 30 PERIODS

COURSE OUTCOMES:
• CO1 - Understanding basic Sanskrit language.
• CO2 - Write sentences.
• CO3 - Know the order and roots of Sanskrit.
• CO4 - Know about technical information about Sanskrit literature.
• CO5 - Understand the technical concepts of Engineering.

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1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

AX5094 VALUE EDUCATION

L T P C
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COURSE OBJECTIVES:
Students will be able to
• Understand value of education and self-development
• Imbibe good values in students
• Let the should know about the importance of character

UNIT I

UNIT II
UNIT III

UNIT IV

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Students will be able to
• Knowledge of self-development.
• Learn the importance of Human values.
• Developing the overall personality.

Suggested reading
1. Chakraborty, S.K."Values and Ethics for organizations Theory and practice", Oxford University
   Press, New Delhi

AX5095 \hspace{1cm} CONSTITUTION OF INDIA \hspace{1cm} L T P C
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COURSE OBJECTIVES:
Students will be able to:
• Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
• To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
• Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
• To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I \hspace{1cm} HISTORY OF MAKING OF THE INDIAN CONSTITUTION:
History, Drafting Committee, (Composition & Working)

UNIT II \hspace{1cm} PHILOSOPHY OF THE INDIAN CONSTITUTION:
Preamble, Salient Features

UNIT III \hspace{1cm} CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES:

UNIT IV \hspace{1cm} ORGANS OF GOVERNANCE:
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V \hspace{1cm} LOCAL ADMINISTRATION:
UNIT VI  ELECTION COMMISSION:
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
1. The Constitution of India, 1950(Bare Act), Government Publication.

AX5096  PEDAGOGY STUDIES

COURSE OBJECTIVES
Students will be able to:
- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I   INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II   THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III   EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT IV   PROFESSIONAL DEVELOPMENT
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V   RESEARCH GAPS AND FUTURE DIRECTIONS
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

**COURSE OUTCOMES:**
Students will be able to understand:
- What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

**SUGGESTED READING**

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**AX5097**

**STRESS MANAGEMENT BY YOGA**

**COURSE OBJECTIVES**
- To achieve overall health of body and mind
- To overcome stress

**UNIT I**
Definitions of Eight parts of yoga.(Ashtanga)

**UNIT II**
Yam and Niyam - Do’s and Don’t’s in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

**UNIT III**
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES**
Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

**SUGGESTED READING**
AX5098 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

COURSE OBJECTIVES:
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT I
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT II
Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Students will be able to
- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neet is hatakam will help in developing versatile personality of students.

SUGGESTED READING
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010