



**COEP Technological University [COEP Tech]  
(A Unitary Public University of Government of Maharashtra)  
(Formerly College of Engineering Pune [COEP])**

## **Department of Manufacturing Engineering and Industrial Management**



**NEP Compliant Curriculum Structure (PG Program)**

**M. Tech. (Project Management)**

**(Effective from: A.Y. 2023-24)**

**PG Program [M. Tech. (Project Management)]**  
**Proposed Curriculum Structure**  
**W. e. f. AY 2023-24**

**List of Abbreviations**

<b>Abbreviation</b>	<b>Title</b>	<b>No of courses</b>	<b>Credits</b>	<b>% of Credits</b>
PSMC	Program Specific Mathematics Course	1	4	5.88 %
PSBC	Program Specific Bridge Course	1	3	4.41 %
PCC	Program Core Course	5	17	25 %
PEC	Program Specific Elective Course	3	9	13.24 %
LC	Laboratory Course	2	4	5.88 %
VSEC	Vocational and Skill Enhancement Course	2	18	26.47 %
OE	Open Elective	1	3	4.41 %
SLC	Self-Learning Course	2	6	8.82 %
AEC	Ability Enhancement Course	1	3	4.41 %
MLC	Mandatory Learning Course	2	--	--
CCA	Co-curricular & Extracurricular Activities	1	1	1.47 %
Total		21	68	100.0%

**PG Program [M. Tech. (Project Management)]  
Proposed Curriculum Structure**

**Semester I**

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	PSMC	PSMC-01	Applied Statistics	3	-	-	2	3
2.	PSBC	PSBC-01	Enterprise Resource Planning	3	-	--	1	3
3	PCC	PCC-01	Principles of Project Management	2	1	--	1	3
4	PCC	PCC-02	Production and Operations Management	3	--	--	1	3
5	PCC	PCC-03	Business Environment & Corporate Strategies	2	-	-	1	2
	PEC	PEC-01	Modelling of Production Systems	3	--	--	1	3
			System Engineering and Maintenance Management					
			Project Risk Management					
			Ethics and Value Based Leadership					
6	AEC	AEC-01	Financial Planning & Management	3	--	--	1	3
7	LC	LC-01	Enterprise Resource Planning Laboratory	--	--	2	--	1
8	PSMC	PSMC-02	Software Laboratory	-	-	2	-	1
<b>Total</b>				<b>19</b>	<b>1</b>	<b>4</b>	<b>8</b>	<b>22</b>

**PG Program [M. Tech. (Project Management)]  
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**Semester II**

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme				Credit
				L	T	P	S	
1	OE	OE-19001	Open Elective	3	--	--	2	3
2	PCC	PCC-04	Human Resource Management	3	--	--	2	3
3	PCC	PCC-05	Quantitative Techniques in Project Management	2	1	--	2	3
4	PCC	PCC-06	Decision Making and Optimization	2	1	--	2	3
5	MLC	ML-01	Research Methodology and Intellectual Property Rights	2	--	--	--	--
6	MLC	ML-02	Effective Technical Communication	1	--	--	--	--
7	PEC	PEC-02	Supply Chain and Logistics Management	3	--	--	2	3
			Reliability Engineering					
			Management Information System					
			Business and Commercial Laws					
8	PEC	PEC-03	Agile Project Management	3	--	--	2	3
			Ergonomics in Design and Manufacturing					
			Materials Management					
			Entrepreneurship Essentials					
9	CCA	CCA-01	Liberal Learning Course	1	--	--	--	1
10	LC	LC-02	Decision Making and Optimization Laboratory	--	--	2	--	1
11	LC	LC-03	Creative Problem-Solving Laboratory	--	--	2	--	1
12	LC	LC-04	Simulation Laboratory	--	--	2	--	1
<b>Total Credits</b>				<b>20</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>22</b>

\*Dept offers 'Project Planning & Control' course to students of other programmes.

➤ Exit option to qualify for **PG Diploma in Project Management**:

- Eight weeks domain specific industrial internship in the month of June-July after successfully completing first year of the program.

**PG Program [M. Tech. (Project Management)]**  
**Proposed Curriculum Structure**

**Semester-III**

Sr. No.	Course Code	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	VSEC	VSEC-01	Dissertation Phase – I	--	--	18	12	9
2.	SLC	SLC-01	Massive Open Online Course -I	3	--	--	3	3
			<b>Total Credits</b>	<b>Max 12</b>				

**Semester-IV**

Sr. No.	Course Code	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	VSEC	VSEC-02	Dissertation Phase – II	--	--	18	12	9
2.	SLC	SLC-02	Massive Open Online Course -II	3	--	--	3	3
			<b>Total Credits</b>	<b>Max 12</b>				

➤ **MOOC Courses:**

- ✓ The MOOC Course must be from NPTEL of minimum 12 weeks duration.
- ✓ Generally the selected course should be in line with specializations or project needs.

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### **Program Educational Objectives (PEO's)**

**PEO1 Core Competence:** To provide students with fundamental and technical knowledge and skills in Project Management and to enable and empower them to solve problems of the modern industrial world.

**PEO2 Depth (Research culture):** To imbibe a scientific perspective in the students to make a decision of products/systems using Statistical, Engineering/Technical and Simulation tools.

**PEO3 Professionalism:** To acquaint students with technical, managerial and human skills and familiarize them with professional issues like ethics and morality, Intellectual property Rights, Constitution of India and Environmental responsibility

**PEO4 Learning Environment:** To motivate students for entrepreneurship and inculcate a spirit of continuous lifelong learning for a successful professional career.

### **Program Outcomes (PO's)**

**PO1** An ability to independently carry out research /investigation and development work to solve practical problems.

**PO2** An ability to write and present a substantial technical report/document.

**PO3** The graduates will be able to demonstrate a degree of mastery over the Project Management areas of the program

**PO4** The graduates will develop capacity to understand multidisciplinary engineering and management areas and display skills for project planning, deployment and execution in the most cost effective and environment friendly manner.

**PO5** The graduates will exhibit effective communication skills with equal expertise to communicate with engineers and with the community at large.

**PO6** The graduates will have a sound foundation of business ethics, professional integrity and social responsibility along with introspection skills and positive outlook for taking corrective measures based on external feedback.

### Correlation between the PEOs and the POs

<b>PO1</b> <b>PEO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>PEO1</b>	√	√	√	√		√
<b>PEO2</b>	√	√	√	√	√	
<b>PEO3</b>			√	√	√	√
<b>PEO4</b>					√	√

### M. Tech. (Project Management) Curriculum Structure (w. e. f. 2019-2020)

Abbreviation	Title	No of courses	Credits	% of Credits
PSMC	Program Specific Mathematics Course	1	4	5.88 %
PSBC	Program Specific Bridge Course	1	3	4.41 %
PCC	Program Core Course	5	17	25 %
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## Program Specific Mathematics Course (PSMC)

### (MA-19001) Applied Statistics

#### Teaching Scheme

Lectures: 3 hrs/week

#### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

#### Course Outcomes:

At the end of course students will be able to

- Understand basic concepts of probability & statistics and apply as per the characteristics in data analysis
- Apply the concept of Hypothesis testing to carry out Regression analysis
- Perform ANOVA and plan Design of Experiments
- Apply statistical quality control tools for various applications

#### Course Contents:

Probability Theory and Sampling Distributions. Basic probability theory along with examples.

Standard discrete and continuous distributions like Binomial, Poisson, Normal, Exponential etc. Central Limit Theorem and its significance.

Inferences on Means and Standard Deviations , Inferences on a Population or Process Mean, Confidence Intervals, Hypothesis Tests, Choice of a Confidence Interval or a Test, Sample Size, Inferences on a Population or Process Standard Deviation Confidence Intervals, Inferences on Two Populations or Processes Using Independent Pairs of Correlated Data Values, Inferences on Two Populations or Processes Using Data from Independent Samples, Comparing Standard Deviations from Several Populations, estimating the difference between two means and ratio of two variances. Some sampling tests like  $\chi^2$ , t, F.

Statistical Hypotheses: General Concepts , Testing a Statistical Hypothesis , The Use of *P*-Values for Decision Making in Testing Hypotheses, Single Sample: Tests Concerning a Single Mean , Two Samples: Tests on Two Means , Choice of Sample Size for Testing Means, One Sample: Test on a Single Proportion, Two Samples: Tests on Two Proportions One- and Two-Sample Tests Concerning Variances, Goodness-of-Fit Test

ANOVA: One – way, Two – way with/without interactions, Latin Squares ANOVA technique,

Principles of Design Of Experiments, some standard designs such as CRD, RBD, LSD.



Statistical Quality Control, Introduction, nature of control limits, purpose of control charts, control charts for variables, control charts for attributes.

Statistical analysis with R, Statistical models in R, Formulae, Generic functions, Packages, Linear models, Analysis of variance, Updating generalised linear models, families, Nonlinear least squares and maximum likelihood models.

### References:

1. Ronald E. Walpole, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineers and Scientists (9<sup>th</sup> Edition), Pearson Prentice Hall, 2012
2. Douglas C. Montgomery, "Design and Analysis of Experiments" (7<sup>th</sup> Edition), Wiley Student Edition, 2009.
3. S. P. Gupta, "Statistical Methods", S. Chand & Sons, 37<sup>th</sup> revised edition, 2008
4. William W. Hines, Douglas C. Montgomery, David M. Goldsman, "Probability and Statistics for Engineering", (4<sup>th</sup> Edition), Wiley Student edition, 2006
5. Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for Engineers, 3<sup>rd</sup> Edition, John Wiley & Sons, Inc., 2003.

## Program specific Bridge Course(PSBC)

### (PPM-19007) Enterprise Resource Planning

#### Teaching Scheme

Lectures : 3 hrs/week

#### Examination Scheme

T1 – 20, T2 – 20, End-Sem Exam – 60.

### Course Outcomes:

At the end of course students will be able to

- Use the ERP modules
- Generate the reports and analyse it
- Carry out financial accounting and managerial accounting

### Course Contents:

Basic Concepts of ERP, Evolution of ERP system, Major features of ERP, Benefits of ERP, Seller-Buyer Concept of ERP System, Introduction to Modules of ERP system, different vendors of ERP.

Materials Management: Basic Features of MM module, SAP MM Organizational Structure, Master data in SAP MM Module: Material Master, Vendor Master, Purchase Info Record, Types of Business Processes in Procurement: Procure to Pay Process, Generation of reports and its analysis.

Sales and Distribution: Basic features of SD module, Organizational structure of SD module, Master Data in SD Module: Material Master, Customer Master, Conditions Master, Types of Business Processes in Sales and Distribution: Order-to-Cash Process, Generation of reports and its analysis

Production Planning: Types of Manufacturing in PP, Organizational Structure of PP Module, Master Data in PP Module : Material Master Data, Work Center, Bill of Material, Routing, Capacity Planning, Sales & Operation planning, Demand management, Material Resource Planning, Business Processes in PP Module: Production Processing Cycle, Generation of reports and its analysis

Financial Accounting and Management Accounting: Basic Accounting Terms :Account, Business Transaction, Capital Expenditure, Revenues Expenditure, Capital Receipt, Revenue Receipt, Deferred Capital, Expenditure, Income, Debtor, Creditor, Sales Assets, Fixed Assets, Current Assets, Long Term Liabilities, Current Liabilities etc. FI Organizational Structure, FI Master Data, FI Processes

### References:

1. Simha R. Magal, Jeffrey Word, Integrated Business Processes with ERP Systems, Wiley
2. Gopal Krishnan .P, Materials Mgmt: An Integrated approach, Phi Learning
3. Glynn C.Williams, Implementing SAP ERP Sales and Distribution, Tata McGraw Hill
4. R.Panneerselvam, Production and Operation Management, PHI Learning
5. Barry Gerhart , Raymond Noe, John Hollenbeck,Patrick Wright, Human Resource Mngement, Tata Mcgraw Hill
6. Khan & Jain, Basic Financial Management, Tata McGraw Hill

## (PPM-19001) Principles of Project Management

### Teaching Scheme

Lectures:3 hr/week

### Examination Scheme

T1, T2- 20 marks each, End-Sem Exam - 60

### Course Outcomes:

At the end of the course, students will be able to :

- Understand Comprehensive fundamental and technical knowledge of Project Planning.
- Apply leadership and decision making capabilities
- Apply the concept of project through project planning steps.
- Analyze the projects through network techniques and handle financial aspects of project

## Course Contents:

An Overview of Project Management , The Role of the Project Manager ,Planning the Project, Developing a Mission, Vision, Goals, and Objectives for the Project, Creating the Project Risk Plan ,Using the Work Breakdown Structure to Plan a Project ,Scheduling Project Work ,Producing a Workable Schedule, Project Control and Evaluation ,The Change Control Process ,Project Control Using Earned Value Analysis ,Managing the Project Team ,The Project Manager as Leader

Function of Project Planning –Inter dependency relationship, Generation and screening of project ideas, project rating index, ,Characterization of the market, demand forecasting, market planning. Basic principles of measurement of cash flows, components of the cash flow streams – viewing a project from different points of view, definition of cash flows by financial institutions and planning commission,

Forms of project organization, project planning, project control, human aspects of project management, prerequisites for successful project implementation.  
Project review and administrative aspects: Initial review, performance evaluation, abandonment analysis, administrative aspects of capital budgeting, evaluating the capital budgeting system of an organization.

Network techniques for project management, development of project network, time estimation, determination of critical path, scheduling when resources are limit, PERT and CPM models.

## References:

1. Prasanna Chandra, Project Planning: Analysis, Selection, Implementation and Review, Tata McGraw Hill. 7th Edition, 2009
2. Narendra Singh, Project Management and Control, HPH, 2003
3. John M. Nicholas and Herman Steyn, Project Management for Business and Technology: Principles and Practice, Prentice Hall India
4. Clifford F. Gray & Eric W. Larson, Project Management: The Managerial Process, Tata McGraw Hill, 2010
5. Harold Kerzner, 'Project Management, A systems approach to Planning, Scheduling & controlling', Wiley India (P) Ltd., 10<sup>th</sup> Edition, 2013

## (PPM -19002) Production and Operations Management

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2- 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Understand the organization and Production Systems and functional units of organization
- Identify best location of production and service facilities & layout planning
- Implement different approaches like JIT, TQM, Value Analysis

### Course Contents:

Organization structure, Production Systems  
Operations and Productivity ,Operations Functions and Evolution of POM;  
Framework for Managing Operations; Operations Strategy; Trends in  
Operations Management

Product and Process Design ,Product Development; Product Design Tools;  
Design of Services; Flexible Manufacturing; Systems; Process Design: Types  
of Process, Modern Production Technologies; Process Reengineering

Capacity Design, Capacity Management; Economies and Diseconomies of  
Scale and Learning Curve; Capacity Strategies; Decision Trees

Facility Location, Location Strategy and its Importance; Factors influencing  
Plant Location; Globalization; Location Selection Models, Layout Design, Layout  
Planning; Layout Types; Design of Product and Process Layouts; Job Design;  
Work Measurement

Inventory Management, Basic Economic Order Quantity (EOQ) Model; Quantity  
Discount Models; Spare Parts Inventory; Material Resources Planning;  
Manufacturing Resource Planning; Purchasing Objectives

Operations Planning and Scheduling, Systems Aggregate Planning and its  
Process; Master Scheduling; Aggregate Planning for Service Organizations;  
Operating Schedules; Sequencing Rules; Optimized Production Technology  
and Synchronous Manufacturing; Just in Time (JIT) Manufacturing System;  
TQM, Value Analysis

### References:

1. J.S.Martinich, "Production & Operations Management", Wiley International, 1997
2. Ram Naresh Roy, "A Modern Approach to Operations Management", New age International Publishers, New Delhi, 2004

3. Buffa, R.K. Sarin, "Modern Production/ Operations Management", John Willey and sons, 8<sup>th</sup> edition, 2009
4. Everett E Adam, Ronald J Ebert , "Production and Operation Management", PHI,2010

### **(PPM -19003) Financial Planning and Management**

#### **Teaching Scheme**

Lectures: 3 hrs/week

#### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam  
- 60

#### **Course Outcomes:**

At the end of course students will be able to

- Understand the concept of Financial Management
- Apply the knowledge of financial accounting in Balance sheet preparation and there by determine Ratio Analysis
- Apply knowledge of Financial Management in determining Marginal costing, Standard costing & Job costing
- Use appraisal criteria and risk assessment in financial planning

#### **Course Contents:**

Financial Management, objectives and goals, Fixed Capital, Floating Capital, Fund flow analysis and Fund flow statements. Ratio analysis: Classification, structural group, standards for comparison and limitations

Profit planning and Break-even analysis, margin of safety. Financial Budgets, control measures, Authorized capital, working capital, reserve, capital Management, floating of shares, share capitals & fund raising –methods and their appraisal.

Control measures– Payback approach, Standard costing, Actual costing, Operating ratio, techniques of cost control, Marginal cost.

Elements of Costs: Material, Labour, Expenses, Overheads, Direct and Indirect Cost, Fixed and Variable Cost, other classifications. Allocation of overheads Methods for Depreciation calculation, Budgetary control and Variance analysis, Activity based costing (ABC). Biases in cash flow estimation.

Appraisal criteria: Net Present Value, benefit cost ratio, internal rate of returns urgency, payback period, accounting rate of returns, investment appraisal in practice

Analysis of Risk, Types and measure of risk , simple estimation of risk, sensitivity analysis, scenario analysis, Special decision situations: Choice between mutually exclusive projects of unequal life, optimal timing decision, determination of economic life, inter-relationships between investment and financing aspects, inflation and capital budgeting. Analysis of firm and market risk:

Portfolio theory and capital budgeting, Capital Asset Pricing Model.

### References:

1. J Pandey I M., Financial Management, Vikas Publication, 10<sup>th</sup> Edition 2013
2. Henry M. Stenier, "Engineering economics Principles", McGraw Hill Publication.
3. C. B. Gupta, "Fundamentals of Business", Sultan Chand & Company.
4. S. K. Basu, K.C. Sahu and Rajiv B, "Industrial Organisation and Management", PHI New Delhi, Nov 2012.
5. Larry M Walther, Christopher J. Skousen, Managerial and Cost Accounting, Ventus Publishing, 2009

## (PPM 19004) Business Environment and Corporate Strategies

### Teaching Scheme

Lectures: 2 hrs/week

### Examination Scheme

T1-20, T2– 20 marks, End-Sem Exam - 60

### Course Outcomes:

At the end of course students will be able to

- Understand the concept of Business Planning
- Apply the strategic plans
- Apply knowledge of Performance Indicators and e business models

### Course Content:

Importance of Business Planning, Achieving business stability and growth, Business goals, Structure of a business plan, Global and transnational business, The global and transnational strategic management process, issues with global and transnational strategies and management.

Strategic analysis- overview, Environmental Mapping, Industry Mapping, SWOT analysis, From To analysis, Root cause analysis, Market analysis, Market mapping, Strategic Business Unit (SBU) analysis, Benefits of SBU analysis, Competitor profiling, Directional policy matrix, Competitive positioning: generic strategies and differentiation, Differentiation and price.

Contribution Approach, Product and service pricing, Cost profiling, Organizational analysis, McKinsey '7S' model.

Option Appraisal, Force-field analysis, Stakeholder analysis, Financial sensitivity, risk exposure evaluation, Evaluating business development options, 'AID' analysis.

Performance measurement, Strategic Key Performance Indicators (SKPIs), Financial Key Performance Indicators (FKPIs), Operational Key Performance Indicators (OKPIs), City Key Performance Indicators (CKPIs), Value added.

E-Business -Concepts and Trends, Competitive Strategy, E-Business Models, Determining Appropriate Models, Infrastructure Capabilities, Strategic Agility, Strategic Planning, The Y Model for Strategy Work, Resource-Based Strategy, Activity-Based Strategy.

#### **Reference Books:**

1. Tim Berry, *HURDLE: The Book On Business Planning*- Millennium Edition.
2. George Stonehouse, *Global and Transnational Business: Strategy and Management*- 2<sup>nd</sup> Edition.
3. Paul Elkins, *Mastering Business Planning And Strategy*-2<sup>nd</sup> Edition.
4. Michael George, *Conquering Complexity in your Business*- McGraw Hill

### **(PPM -19005) Software Laboratory**

#### **Teaching Scheme**

Practical : 2 hrs/week

#### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam  
- 60

#### **Course Outcomes:**

At the end of course students will be able to

- Perform regression, ANOVA, F, t, and Chi Square tests
- Use Design of experiments and statistical quality control tools
- Use of MS Project to perform CPM /PERT analysis

#### **Course Contents:**

- Sampling tests like  $\chi^2$ , t, F.
- One - and Two - Sample estimation problems estimating the mean and variance
- ANOVA technique,
- Design of Experiments,
- Control Charts
- MS Project Assignments
- CPM /PERT analysis using MS Project
- Mini project using above tools & Techniques

## **(PPM -19006) Enterprise Resource Planning Laboratory**

### **Teaching Scheme**

Practical : 2 hrs/week

### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### **Course Outcomes:**

At the end of course students will be able to

- Understand organizational structures used in each business process;
- Maintain Key master data to execute each business process;
- Apply ERP transactions required to complete each business process cycle;
- Use Key integration points between the different business disciplines supporting each business process cycle

### **Syllabus Contents:**

1. SAP Navigation
2. Case Study on SAP-MM Organizational Structure – Finolex
3. Execution of Procure-to-Pay Cycle and report generation and its analysis
4. Case Study on SAP-SD Organizational Structure – Titan
5. Execution of Order to Cash Process and report generation and its analysis
6. Review of Organizational structure in PP
7. Theory assignment on MRP
8. Execution of Manufacturing Process Cycle and report generation and its analysis

## **Departmental Elective Course -I**

### **(PPM-DE 19001) Modelling of Production Systems**

### **Teaching Scheme**

Lectures: 3 hrs/week

### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### **Course Outcomes:**

At the end of course students will be able to

- Identify the type of Production system and its modelling.
- Perform line balancing and buffer stock simulation
- Analyse the production system using Markov chain & Petri Net



### Course Contents:

Dedicated manufacture versus Flexible manufacture, mechanization versus automation, semi automatic versus automatic systems using 'in-line' transfer, rotary transfer, material Handling systems

Balancing of assembly line, Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation. Monte carlo simulation

Modelling and Analysis of FMS, Cellular Manufacturing Systems.

Markov chain analysis for production systems with discrete time and continuous time analysis. Markov chain analysis with zero or with one or more repair facility, Reversible markov chains in manufacturing,

Uses of Petri Nets. Generalized timed Petri Nets, Extended stochastic Petri Nets and their applications in Production systems.

### References:

1. N. Viswanadhan & Y. Narahari, "Performance Modelling of Automated Manufacturing Systems", Prentice Hall of India (Eastern Economy Edition) 1992.
2. Mikell P. Groover, "Automation, Production Systems & Computer Integrated Manufacturing" , Prentice Hall India Learning Pvt. Ltd.3<sup>rd</sup> Edition. 2008
3. Benjamin S. Blanchard, "Logistics Engineering and Management (5th Edn.) - Pearson Education Asia - Indian Reprint 2001

## (PPM DE 19002)System Engineering and Maintenance Management

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1-20, T2 – 20 marks , End-Sem Exam - 60

### Course Outcomes:

At the end of the course, students will be able to:

- Understand the System and apply System Engineering approach
- Apply effective maintenance policies to system
- Apply Reliability Centered Maintenance principles

### Course Contents:

Introduction to Systems Engineering, Systems Engineering Viewpoint , Perspectives of Systems Engineering, Systems Domains , Systems Engineering Fields , Systems Engineering Approaches , Systems Engineering Activities and Products, Evolutionary Characteristics of the Development Process , Systems Engineering Method, System development phases and cycles system development life cycle

approach. Overview of the systems engineering, system life cycle, and the product development life cycle. Phase gate approach to product development enabled by application of systems engineering principles

System Concept ,Exploration and the types of systems, requirements. Dual nature of validation, and its differences from verification. Requirement analysis, requirements development, and how these relate to planning for systems integration, verification and validation. Functional analysis, interface analysis, requirement allocation, traceability, and use of commercial tools to enable effective application of SE principles in an integrated team environment.

Types of Maintenance, maintenance activities, emergency work, service work, Industrial Maintenance, Total Production maintenance, Maintenance problems occurring in product and process type industries and Power plants and their management

Elements of Effective Maintenance Management,Maintenance Policy,Material Control,Work Order System,Equipment Records,Preventive and Corrective Maintenance

Backlog Control and Priority System, Performance Measurement, Maintenance Project Control Methods,Activity Expected Duration Time Estimation,Critical Path Method (CPM),Maintenance Management Control Indices,Broad Indicators,Specific Indicators.

Preventive Maintenance Elements, Plant Characteristics in Need of a PM,Program, and a Principle for Selecting Items for PM,Important Steps for Establishing a PM Program,PM Measures,Corrective Maintenance Types,Corrective Maintenance Steps, Downtime Components, and Time Reduction Strategies at System Level, Corrective Maintenance Measures

Reliability Centered Maintenance, RCM Goals and Principles, RCM Process ,RCM Components,Reactive Maintenance, Preventive Maintenance, Predictive Testing and Inspection, Proactive Maintenance, Predictive Testing and Inspection Technologies. On-line / off-line Condition based Maintenance through ferrography, Vibration Signature, SOAP and other programme

### **References:**

1. Alexander Kossiakoff,William N. Sweet,Samuel J. Seymour, Steven M. Biemer, Systems Engineering Principles and Practice, Wiley Publication.
2. B.S.Dhillon, Engineering Maintenance, A Modern Approach, CRC Press.

**(PPM DE 19003) Project Risk Management**  
**Teaching Scheme**  
Lectures: 3 hrs/week

**Examination Scheme**  
T1-20, T2 – 20 marks, End-Sem Exam -  
60

**Course Outcomes:**

At the end of the course, students will demonstrate the ability to:

- Apply the concept of risk identification - across a variety of project categories and industry segments
- Apply qualitative and quantitative methods of risk assessment in project management scenarios
- Plan and pre-empt risks & apply risk mitigation strategies appropriately

**Course Contents:**

Project Risk Management, Role of Project Risk Management in Project Management, Good Risk Management Practice, Critical Success Factors for Project Risk Management

Principles and concepts of Project Risk , Individual Risks and Overall Project Risk, Stakeholder Risk Attitudes , Iterative Process , Communication, Responsibility for Project Risk Management, Project Manager's Role for Project Risk Management, Project Risk Management Processes

The project risk management approach , Establish the context , Risk identification , Qualitative risk assessment , Semi-quantitative risk assessment , Risk treatment , Monitoring and review, Communication and reporting , Project processes and plans , Simplifying the process , Managing opportunities

Planning and pre-empting risks- for unknown variables affecting a project/program/organization: Understanding Risk Mitigation & Stakeholder Management – techniques and methods

Introduction to developing a culture of planned risk taking and provisioning for financial and non- financial impact of such risks

**References:**

1. Dale F. Cooper, Stephen Grey, Geoffrey Raymond and Phil Walker, Project Risk Management Guidelines, Managing Risk in Large Projects and Complex Procurements, John Wiley & sons, 2005
2. Practice Standard.For Project Risk Management, Project Management Institute, Inc,2009

## (PPM DE 19002) Ethics and Value based Leadership

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of the course, students will be able to:

- Use Moral and Ethics in individual behavior
- Demonstrate and Apply leadership qualities
- Handle Corporate responsibility

### Course Contents:

Moral concepts – values; Personal values, Moral concepts – relationships, community Stakeholders versus stockholders, Social responsibility, Corporate citizenship

Ethical decision making models; Ethical problems that arise in business, Moral concepts – honesty, fairness, equality, unethical dual relationships, Corporate responsibility – ethical and legal issues, Construct an ethical argument

Ethical problems that arise in business, Ethics versus law, Sarbanes-Oxley, Whistle blowing

Federal Sentencing Guidelines for Organizations, Moral concepts including instrumental and intrinsic goodness, values, justice, and vision, Moral philosophies including consequentialist, non-consequentialist, virtue ethics and justice ethics, Relativism Ethical and decision making models and frameworks, Ethical issue intensity, Moral intensity,

Economic value orientation, Kohlberg's theory of moral development, Ethical spheres of influence, Personal values and vision and their role in a business environment, Qualities of ethical leadership, Roles and habits of leaders, Transitional leader, Transformational leader, The role of organizational culture and corporate governance in business ethics. Power – reward, coercive, legitimate, expert, referent, Motivation, Group norms – formal and informal

Corporate responsibility and the role of ethics audits, environmental audits and social audits

Ethical problems that arise in business

### References:

1. Kouzes and Posner, The Leadership Challenge
2. Robert Lorber, "Organizational behavior, An Experiential Approach."

## **(PPM-19008) Quantitative Techniques in Project Management**

### **Teaching Scheme**

Lectures: 3 hrs/week

### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### **Course Outcomes:**

At the end of course students will be able to

- Apply techniques of conceptual modeling of real life decision making problems,.
- Analyze various models in real life case studies and learn about decision making.
- Simulate the models and optimize it.

### **Course Contents:**

Introduction to Integer programming, Solution of Integer programming by various methods, introduction to Goal programming and parametric programming

Dynamic programming models;

Various models in queuing; inventory control models

Network theory- maximal flow and minimal spanning tree problems

Game theory- linear programming methods to solve mixed strategy games ,

Vehicle routing problems and various mathematical models, transshipment, travelling salesman problems;

Simulation modelling & analysis, optimization models used in manufacturing – such as Linear programming models, multi goal programming etc.

### **References:**

1. Sharma J.K. : Operations Research Theory & Applications, Macmillan India Ltd.
2. Rao, S.S: Optimisation in Design, New Age International Limited Publishers, Fourth Edition, 2008.
3. Hamdy A. Taha : Operations Research, An Introduction, PHI Learning Pvt. Ltd., New Delhi.
4. Wagner Harvey M. : Principles of Operations Research with Applications to Managerial Decisions, Prentice Hall of India Pvt. Ltd., New Delhi.
5. Shenoy G.V. : Linear Programming Methods and Applications, Wiley Eastern Ltd.
6. Deb Kalyanmay : Optimisation in Engineering Design, PHI

## (ML-19011) Research Methodology and Intellectual Property Rights

### Teaching Scheme

Lectures: 2 hr/week

### Examination Scheme

Marks: 100

### Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand research problem formulation and approaches of investigation of solutions for research problems
2. Learn ethical practices to be followed in research
3. Apply research methodology in case studies
4. Acquire skills required for presentation of research outcomes (report and technical paper writing, presentation etc.)
5. Infer that tomorrow's world will be ruled by ideas, concept, and creativity
6. Gather knowledge about Intellectual Property Rights which is important for students of engineering in particular as they are tomorrow's technocrats and creator of new technology
7. Discover how IPR is regarded as a source of national wealth and mark of an economic leadership in context of global market scenario
8. Study the national & International IP system
9. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits

#### Unit 1:

[5Hrs]

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 2:

[5Hrs]

Effective literature studies approaches, analysis

Use Design of Experiments /Taguchi Method to plan a set of experiments or simulations or build prototype

Analyze your results and draw conclusions or Build Prototype, Test and Redesign

#### Unit 3:

[5Hrs]

Plagiarism, Research ethics

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 4 :

[4Hrs]

Introduction to the concepts Property and Intellectual Property, Nature and Importance of Intellectual Property Rights, Objectives and Importance of understanding Intellectual Property Rights

**Unit 5 :****[7Hrs]**

Understanding the types of Intellectual Property Rights: -Patents-Indian Patent Office and its Administration, Administration of Patent System – Patenting under Indian Patent Act , Patent Rights and its Scope, Licensing and transfer of technology, Patent information and database. Provisional and Non Provisional Patent Application and Specification, Plant Patenting, Idea Patenting,

Integrated Circuits, Industrial Designs, Trademarks (Registered and unregistered trademarks), Copyrights, Traditional Knowledge, Geographical Indications, Trade Secrets, Case Studies

**Unit6 :****[4Hrs]**

New Developments in IPR, Process of Patenting and Development: technological research, innovation, patenting, development,

International Scenario: WIPO, TRIPs, Patenting under PCT

**References:**

1. Stuart Melville and Wayne Goddard, "Research methodology: An Introduction for Science and Engineering Students", Juta and Company Ltd.
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction", Juta and Company Ltd, 2004
3. Ranjit Kumar, "Research Methodology: A Step by Step Guide for Beginners", SAGE Publications, 2<sup>nd</sup> edition, 2005.
5. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007
6. Mayall , "Industrial Design", McGraw Hill
7. Niebel , "Product Design", McGraw Hill
8. Asimov , "Introduction to Design", Prentice Hall
9. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", Aspen Publishers, 6<sup>th</sup> Edition.
10. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand.

**(ML-19012)Effective Technical Communication****Teaching Scheme:****Lectures: 1hr / week****Evaluation Scheme:****100M: 4 Assignments (25M each)****Course Outcomes (COs):****Student will be able to**

1. Produce effective dialogue for business related situations
2. Use listening, speaking, reading and writing skills for communication purposes and attempt tasks by using functional grammar and vocabulary effectively
3. Analyze critically different concepts / principles of communication skills
4. Demonstrate productive skills and have a knack for structured conversations

5. Appreciate, analyze, evaluate business reports and research papers

**Unit 1: Fundamentals of Communication****[4 Hrs]**

7 Cs of communication, common errors in English, enriching vocabulary, styles and registers

**Unit 2: Aural-Oral Communication****[4 Hrs]**

The art of listening, stress and intonation, group discussion, oral presentation skills

**Unit 3: Reading and Writing****[4 Hrs]**

Types of reading, effective writing, business correspondence, interpretation of technical reports and research papers

**References:**

1. Raman Sharma, "Technical Communication", Oxford University Press.
2. Raymond Murphy "Essential English Grammar" (Elementary & Intermediate) Cambridge University Press.
3. Mark Hancock "English Pronunciation in Use" Cambridge University Press.
4. Shirley Taylor, "Model Business Letters, Emails and Other Business Documents" (seventh edition), Prentise Hall
5. Thomas Huckin, Leslie Olsen "Technical writing and Professional Communications for Non-native speakers of English", McGraw Hill.

**(PPM-19010) Decision Making and Optimization****Teaching Scheme****Examination Scheme**

Lectures: 2 hrs/week Tutorial: 1 Hr/week T1, T2 – 20 marks each, End-Sem Exam - 60

**Course Outcomes:**

At the end of course students will be able to

- Apply Multi Attribute Decision Making (MADM) criteria's for real life cases.
- Use Analytical decision making tools for ranking
- Apply optimization algorithms such as GA & PSO

**Course Contents:**

Multi Criteria Decision Making, MAUT and related concepts, Data Envelop Analysis,

Decision Trees, Types, Applications.

Analytical Tools: Simple Additive Weighting Method (SAW), Weighted Product Method (WPM),

Analytical Hierarchy Process (AHP), Fuzzy AHP, Analytical Network Process, steps,



TOPSIS, Modified TOPSIS, Fuzzy TOPSIS, Compromise Ranking Method (VIKOR),

Graph Theory and Matrix Approach, formulation, Applications

ELECTRE method, steps, Applications, numericals

PROMETHE, steps, Applications

Genetic Algorithm (GA), Concept, basic terms, flowchart, algorithm, applications

Simulated Annealing, concept, basic terms, flowchart, algorithm, applications,

Particle Swarm Optimisation. Concept, basic terms, flowchart, algorithm, applications

### References:

1. R.V. Rao, Decision Making in the Manufacturing Environment using Graph Theory and Fuzzy Multiple Attribute Decision Making, Springer-Verlage London Limited, 2007.
2. Bernard P. Zeigler, Herbert Praehofer and Tag Gon Kim, Theory of modeling and simulation: Integrating discrete event and continuous complex dynamic systems - Second edition. Academic Press. 2000.
3. Kalyanmay Deb, Multi objective Optimisation using Evolutionary Algorithm.

## (PPM-19009) Human Resource Management

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam - 60

### Course Outcomes:

At the end of course students will be able to

- Understand the concept of Human Resource Management
- Define the policy goals of HRM & analyse the challenges with international aspect
- Apply various techniques of job evaluation and analysis of work design & Job design
- provide a solution to HR problem using motivation & training as a tool

### Course Contents:

Concept of Human resource management: Functions, objective, and evolution of management, Nature and scope of Human Resource Development.

Procurement and placement: Resource planning, factors affecting HRD, recruitment, selection, induction and placement.

Job evaluation: Performance appraisals, introduction, objective, procedure, and method of job evaluation.

Work design & job design : Ergonomics, human engineering, factors affecting effective job design.

Motivation & Job satisfaction: Introduction, basis of motivation, importance, characteristics, basic principle and kind of motivation, quality of work life, stress management, time management, worker's participation in management.

Training and development : Introduction, Importance, Methods and techniques of training, employee development, quality circle, models of training and development, performance appraisal for training scheme.

Integration: Financial policies related to HRD, human relations- concept, objective, importance, scope and aspect of industrial relation (IR), IR strategy, Causes and effect of industrial dispute, dispute acts, trade unions.

Maintenance: Accidents, economy aspect, causes, employee welfare, social security.

Future challenges for HRM: International aspects of HRD.

### **References:**

1. A.P.Verma, Human resource management, Kataria Publishers, 2006
2. Harold Koontz, Essentials of Management , Tata McGraw-Hill Education, 2010
3. Kelly D, Dual Perceptions of HRD: Issues for Policy: SME's, Other Constituencies, and the Contested Definitions of Human Resource Development. 2001,
4. Nadler L Ed., , The Handbook of Human resources Development, John Wiley and Sons, New York. 1984
5. McLean, G. N., Osman-Gani, A. M., & Cho, E. (Eds.). Human resource development as national policy. Advances in Developing Human Resources, August (2004).

## (PPM-19012) Decision Making and Optimization Laboratory

### Teaching Scheme

Practical : 2 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Perform decision making using AHP, TOPSIS, SAW, WPM, Digraph
- Optimise the parameters using Genetic Algorithm (GA)
- Apply ELECTRE and PROMETHE methods

### Course Contents:

#### Case studies and assignments on:

- Analytical tools: Simple Additive Weighting (SAW), Weighted Product Method (WPM)
- Analytical Hierarchy Process (AHP) for MCDM
- TOPSIS & Modified TOPSIS method for MCDM
- Compromise Ranking Method (VIKOR),
- Graph Theory and Matrix Approach,
- ELECTRE
- PROMETHE
- Genetic Algorithm (GA),
- Simulated Annealing ,
- Particle Swarm Optimisation

## (PPM-19011) Simulation Laboratory

### Teaching Scheme

Practical : 2 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Model & Simulate the system
- Carry out Layout simulation
- Carry out assembly line simulation
- Use linear programming software for analysis.

## Course Contents:

### Case studies and assignments on:

- Basic Simulation Modeling, System model & Simulation, continuous & discrete, simulation of an inventory system, Single server, simulation of simple systems.
- Introduction to Simulation Softwares, comparison of simulation packages with programming languages, classification of simulation software.
- Layout simulation using simple situations
- Assembly line simulation
- Generating and evaluating what –if scenarios for finalizing layout
- Mini project using simulation software

## (PPM- 19013) Creative Problem Solving Laboratory

### Teaching Scheme

Practical : 2 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Solve the problem/task in a creative way.
- Apply brainstorming technique in problem solving
- Clarify, Ideate, develop, Implement the solutions

### Course Contents:

1. Constructive Controversy, Improving Solutions by Arguing For and Against Your Options
2. Inductive Reasoning, Drawing Good, Generalized Conclusions
3. Brainstorming
4. Lateral Thinking
5. Trial & Error
6. C-K Theory
7. Morphological Analysis
8. Systematic Inventive Thinking
9. Clarify, Ideate, develop, Implement

## Departmental Elective Courses (DEC-II)

### (PPM(DE-19005) Supply Chain and Logistics Management

#### Teaching Scheme

Lectures: 3 hrs/week

#### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

#### Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand supply chain flows & supply chain strategies.
2. Design the Supply Chain Network
3. Designing transportation network & analyze factors affecting transportation decisions.

#### Syllabus Contents:

- Introduction to supply chain and logistics management, concept, Supply chain stages and decision phases, process view of a supply chain. Supply chain flows. Competitive and supply chain strategies, importance in project Management
- Designing the Supply Chain Network, Distribution Network - Role, Design. Supply Chain Network (SCN) - Role, Factors, Framework for Design Decisions. Models for Facility Location and Capacity Allocation. Impact of uncertainty on SCN - Discounted Cash Flow Analysis, Evaluating Network Design Decisions using Decision Trees. Case studies & problems.
- Managing Multi-Echelon Cycle Inventory, Safety inventory determination. Impact of supply uncertainty aggregation and replenishment policies on safety inventory. Optimum level of product availability: Importance factors, managerial levers to improve supply chain profitability, supply chain contracts. Case studies & problems.
- Scoring & Assessment, Selection & Contracts. Design Collaboration.
- Role of Revenue Management in the Supply Chain, Revenue Management for : Multiple customer segments, Perishable assets, Seasonal demand, Bulk & spot contracts. Managerial levers to achieve co-ordination, Building strategic partnerships. The role of IT in Supply Chain, The Supply Chain IT Framework, CRM, Internal SCM, SRM. The role of E-business in a supply chain, The E-business framework, E-business in Practice. Case discussions
- Introduction to Logistic Management principles, operation, Design and administration
- System view of logistic co-ordination and transportation order processing, ware housing, material handling, customer service standards, cost analysis case studies, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network.
- Risk management, Types of project risks in SCLM, Risk issues, performance, concept and importance

- Introduction to Global Supply Chain Management. Globalization network design, Green SCLM, understanding supply chain excellence, case studies.

### References:

1. Sunil Chopra & Peter Mcindl, "Supply Chain Management -Strategy, Planning & Operation" Pearson Education Inc, 11th Edition, 2003
2. Douglas Lanibert& James Stock, "Strategic Logistics Management" McGraw Hill, 4<sup>th</sup> Edition, 2004.

## (PPM (DE) 19006) Reliability Engineering

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of the course, students would be able to :

- Apply the concept of Reliability and analysis of various configurations.
- Apply various techniques to analyse failure data.
- apply parametric & nonparametric methods to analyze real life cases of system reliability.

### Syllabus Contents:

Concept of Reliability and analysis of various configurations of assemblies and sub-assemblies. Series, Parallel and other grouping.

System reliability. Set theory, optimal Cut Set and Tie Set, 'star-delta' method, matrix method etc.

System reliability determination through 'Event Tree' analysis and Fault tree analysis.

Usage monitoring of plant and evaluation of reliability through failure data analysis.

Concept of loading roughness, probability in design including evaluation of safety margin. Reliability of Engineering Design; Mean, Median & K statistics for Reliability evaluation (non parametric, Short Sample).

Optimal allocation of component reliability to achieve maximum system reliability – various techniques and methods such as Proportional, Conditional, AGREE, ARINC etc.

Reliability, Availability and Maintainability of equipment. A number of case studies done in Indian perspectives using Short Sample, nonparametric reliability.

Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), Failure Modes, Effects and Criticality Analysis (FMECA). R.P.N., Graph theory etc. Diagnostic maintenance through ferrography, Vibration Signature, SOAP and other programme.

### **References:**

1. L.S.Srinath Concepts in Reliability Engineering- Affiliated East West Press.
2. C. Singh and C.S.Dhillon, Engineering Reliability-New Techniques and Applications –John Wiley and Sons
3. K.C.Kapoor and L.R.Lubersome Reliability in Engineering Design, Willey Publication.
4. Kumamoto, System Reliability, Prentice Hall.
5. Basu S.K., Sahu K.C and Rajiv B. Industrial Organization and Management –PHI New Delhi, 2012

## (PPM( DE) 19007) Business and Commercial Laws

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam - 60

### Course Outcomes:

At the end of the course, students will

- Gain knowledge about basics of laws
- learn about Sale and Acquisition of Goods and Personal Property
- gain knowledge about Consumer Credit and Protection

### Syllabus Contents:

- Basics of law; law of tender; law of tort; role of the project manager; insurance; bonds; builders liens; labour law; intellectual property; avoidance of claims and disputes; ADR, the arbitration act; future trends in contracting.
- Sale and Acquisition of Goods: Transfer of Title, The rule *nemo dat quod non habet*, Exceptions to *nemo dat* Legal Duties of Sellers and Buyers, Express and Equitable Interest, Sale of Goods Applicable Passing of Property, Implied Terms, and Implied Terms, *nemo dat* Remedies Non-sale Acquisitions: exceptions, *nemo dat*, Applicable *nemo dat* exceptions.
- Personal Property: Personal Property and Interests in Personal Property, Types of Personal Property - Chose in Possession - Chose in Action, Ownership (especially mere equities) - Possession (finders' possessory, Legal and Equitable Assignment Credit and Security interests) - Bailment; Types of Security: Pledges - Liens - Mortgages (other than of land) - Bills of Retention of Title Sale - Fixed and Floating Charges (*Romalpa*) Clauses Set-off; Assignments of Choice in Action: Statutory, Legal and Equitable, Assignments, Rules of Priority, Banking and Customer Relationship, Negotiable Instruments: Bills of Exchange.
- Consumer Credit and Protection: Regulatory Money Lenders Ordinance and Pawn Brokers Ordinance, Function and Framework, Power of Consumer Council, Funds for Litigation and Group Litigation Consumer Unconscionable Contracts Law of Guarantees, Consumer Protection, Credit, Supply of Services Control of Exemption Clauses Ordinance, Ordinance, Protection of Vulnerable Money Lenders Ordinance, (Implied Terms) Ordinance, Powers and Consumers: Misrepresentation, Undue Influence, Duress, Responsibilities of Personal Guarantor, Doctrine of relation back and fraudulent preference.

### References:

1. R Goode, "Commercial Law", Penguin, 3<sup>rd</sup> Edition, 2004
2. PS Atiyah, John N Adams & Hector MacQueen, "The Sale of Goods", 11<sup>th</sup> Edition, Longman, 2005
3. LS Sealy, RJA Hooley, "Commercial Law: Text, Cases and Materials", 4th Edition
4. R Calnan, Taking Security: Law And Practice, Jordans, 2006.



5. H Beale, M Bridge, LGullifer and E Lomnicka, The Law of Personal Property. System view of logistic co-ordination and transportation order processing, ware housing,

## **(PPM (DE) 19008) Management Information System**

### **Teaching Scheme**

Lectures: 3 hrs/week

### **Examination Scheme**

T1, T2 – 20 marks each, End-Sem Exam - 60

### **Course Outcomes:**

At the end of the course, students will demonstrate the ability to:

1. Understand System development life cycle approach.
2. Perform Object Oriented Analysis and Design
3. Designing Human computer Interface & decision support system

### **Syllabus Contents:**

Definitions, objective, structure, operating elements, MIS structure based on management activity, organizational function. System concepts - Definition, Types of systems, system decomposition, system entropy, system stress, methods of simplification, design concepts.

SDLC approach - System development life cycle approach, system requirement specifications, entity relationship diagram, data dictionary, report generation, database administration.

Object Oriented Analysis and Design Introduction, concepts of objects, class, encapsulation, various steps of OOA, methods like Booch, Rumbaugh etc. Domain Analysis, Human computer Interface, Introduction to System Testing.

Decision Support System Introduction to decision support system, experts systems, hardware and software acquisition, legal Issues. Information Management and society, Computer security, privacy, manual versus electronic information, back up protection, user interfaces, encryption, responsibility and ethics. Ethical challenges in Information Systems.

### **References:**

1. Roger S Pressman, Software Engineering: A Practitioner's Approach (6th ed.) McGraw-Hill. (2005).
2. Sommerville, Ian, Software Engineering. Harlow, England: Pearson Education (8th ed.)(2007)
3. Jalote, Pankaj, An Integrated Approach to Software Engineering (3rd ed.). Springer. (2005)
4. O'Brien, J (1999). Management Information Systems – Managing Information Technology in the Internetworked Enterprise. Boston: Irwin McGraw-Hill. ISBN 0071123733.
5. Kotler, Philip; Keller, Kevin Lane, Marketing Management (12 ed.). Pearson Education(2006).

## (LL- ) Liberal Learning Course

### Teaching Scheme

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam – 60

Contact Period: 1 hr/week

### Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Learn new topics from various disciplines without any structured teaching or tutoring
2. Understand qualitative attributes of a good learner
3. Understand quantitative measurements of learning approaches and learning styles
4. Understand various sources and avenues to harvest/gather information
5. Assess yourself at various stages of learning

### Course Features:

- 10 Areas, Sub areas in each
- Voluntary selection
- Areas (Sub areas):
  1. Agriculture (Landscaping, Farming, etc.)
  2. Business (Management, Entrepreneurship, etc.)
  3. Defense (Study about functioning of Armed Forces)
  4. Education (Education system, Policies, Importance, etc.)
  5. Fine Arts (Painting, Sculpting, Sketching, etc.)
  6. Linguistics
  7. Medicine and Health (Diseases, Remedies, Nutrition, Dietetics, etc.)
  8. Performing Arts (Music, Dance, Instruments, Drama, etc.)
  9. Philosophy
  10. Social Sciences (History, Political Sc., Archeology, Geography, Civics, Economics, etc.)

### Evaluation:

- **T1:** A brief format about your reason for selecting the area, sub area, topic and a list of 5 questions (20 marks)
- **T2:** Identify and meet an expert (in or outside college) in your choice of topic and give a write up about their ideas regarding your topic (video /audio recording of your conversation permitted (20 marks)
- **ESE:** Presentation in the form of PPT, demonstration, performance, charts, etc. in front of everyone involved in your sub area and one external expert (60 marks)

Reference:

Expert (s), Books, Texts, Newspaper, Magazines, Research Papers, Journal, Discussion with peers or faculty, Internet, etc.

## Departmental Elective Courses (DEC-III)

### (PPM (DE) 19009) Agile Project Management

#### Teaching Scheme

Lectures: 3 hrs/week

#### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

#### Course Outcomes:

At the end of course students will be able to

- Understand Agile philosophy
- Apply various Agile Concept in Project Management
- Use Agile Risk Management techniques

#### Course Content:

Introductions, Agile PM Fundamentals, Stakeholders, Agile Culture, Ethics, Project Selection, Product Owner, Retrospectives, Project Charter, Risk, Scope, User Roles, Product Roadmap, Story Map, User Stories, Agile Culture

Agile Concept, Agile Methods, Agile Tools, Agile Documentation, Agile Tracking and Reporting, Agile Project Management Process, Agile Value,

Agile characteristics , Agile Concepts ,Agile Values, Agile Guiding Principles ,Declaration of Interdependence

The Most Popular Agile Methods ,Scrum Overview ,Scrum Transparency, Adaptation, Inspection ,Iterative and Incremental Development ,Time- Boxing Collaboration ,Self- Organization

Agile Stakeholder Engagement ,Traditional Stakeholder Management Agile Stakeholder Management Concepts,Stakeholder Communications Management ,Information Displays ,Agile Documentation Best Practices

Agile Risk Management, Agile people Skills, Agile Teams, Agile Certification, Agile Contracts, Which projects should be Agile? , Agile Change Management, Additional Agile Methods

#### Reference Books:

1. Rinivan Solingen, Eelco Rustenberg , The Power of Scrum, Jeff Sutherland, , 2012.
2. Joanna Rothman, Pragmatic Bookshelf , Manage Your Project Portfolio, 2009.
3. Jeff Patton, O'Reilly , User Story Mapping, 2014.
4. Denise Cauty Agile for Project Managers by, CRC Press, Taylor and Francis Group
5. Ken Schwaber, Agile Project Management with Scrum , Microsoft Press, 2004
6. Charles G. Cobb, Making Sense of Agile Project Management, Wiley, 2011.
7. Robert K. Wysocki,, Effective Project Management- Traditional, Agile, Extreme , fifth edition, Wiley Publishing,

## (PPM-( DE) 19010) Ergonomics in Design and Manufacturing

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Understand the importance of Human Factors considerations.
- Apply various ergonomic considerations and its significance in designing workplace and Human Factors in design & manufacturing
- Understand dynamic consideration in design of product using vibration stability in bio-mechanisms

### Course Contents:

Introduction: Human Factors and Systems, Information Input and Processing, Visual Displays of Dynamic Information, Human Output and Control: Physical Work and Manual Materials Handling, Motor Skills, Human Control of Systems, Hand Tools and Devices.

Definition of Ergonomics and its significance in designing workplace layout and detailed motion plan of work, Man-Machine Symbiosis, Human Factors in design & manufacturing, Viz. pressure of the environment, temperature, humidity etc., Principles of motion economy, anthropometric condition, stability criterion etc. Biodynamic analysis for design of products & its concept of learning by man and machine;

Measurement of Learning Index and training for each job and each man, Product design – various aspects including ergonomic design and reliability based design.

Dynamic consideration in design of product using vibration stability in biomechanisms. Safety in manufacturing. Considerations of human stress, Allowable limit of stress, stress adjustment.

Estimation of human error and human reliability, combining various forms of human error by random number simulation, Human Error, Accidents and safety, Human Factors and the Automobile, Human Factors in Systems Design.

Dynamic consideration in project operations, leadership, requirement, communication process, motivating a diverse workflow, facilitating team decisions, resolving interpersonal conflicts, managing different people, strengthening team accountability

## References:

1. Sanders, M.M. & McCormick, E.J., Human Factors in Engineering & Design, McGraw-Hill, 7th ed. (1993) NY.
2. S. K. Basu, K.C. Sahu and Rajiv B, Industrial Organisation and Management –, PHI New Delhi, Nov 2012.

## (PPM (DE) 19011) - Materials Management

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Understand consideration in materials Management
- Apply various Inventory control techniques for Materials Management
- Analyse the Economic order quantity

### Course Contents:

Materials management – An overview – Introduction – Scope, Objective, Importance Integrated approach to Materials Management

Material Planning – Introduction – Factors affecting material planning – Techniques of material planning - MRP

Purchasing, Procedure & Pricing Issues – Receipt – Storage - Issue

Inventories – Definition-Classification of Inventories- Need for inventories – Merits & Demerits of Inventories

Inventory control techniques and principles - classification, codification, standardization – ABC analysis –VED, GOLF, FSN - HML

Economic order quantity concept – Derivation of EOQ formula, modified EOQ , Case Studies

Mathematical versions of modified EOQ models,

Vender development, vender selection

Replenishment systems, Material forecasting, Material storage systems, ASRS. Material Handling equipments, stores layout, warehouse management.

### Reference Books

1. Shailesh Kasande, Materials and logistics Management
2. L. C. Jhamb, Materials and logistics Management
3. K. K. Ahuja, Materials Management,
4. Gopalkrishnan & Sundersan, An integrated approach to Materials Management

## (PPM (DE) 19012) Entrepreneurship Essentials

### Teaching Scheme

Lectures: 3 hrs/week

### Examination Scheme

T1, T2 – 20 marks each, End-Sem Exam  
- 60

### Course Outcomes:

At the end of course students will be able to

- Use Entrepreneurial approach
- Apply design thinking and TRIZ
- Analyse the opportunities based on financial, break even and margin of safety.
- 

### Course Contents:

Definition, Innovation and entrepreneurship, Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks. Corporate entrepreneurship or intrapreneurship.

Opportunity Identification, factors determining competitive advantage, Market segment, market structure, blue ocean strategy, Marketing research, Demand-supply analysis, Value proposition, Business Model Canvas, Developing an Effective Business Model, Legal forms of business. Design Thinking, Design-Driven Innovation, TRIZ (Theory of Inventive Problem Solving),

Zero-based design, Systems thinking, SPRINT Lean product development, Lean entrepreneurship, Lean manufacturing, Go-to-market strategy, balance team and its importance, Recruiting early employees, Writing a business plan, Pitching.

Preparing financial statements, analysis of opportunities based on -Financials, break-even & margin of safety

Government incentives for entrepreneurship, Incubation, acceleration, Funding new ventures, Legal aspects of business

### References

1. Norman M. Scarborough, Jeffrey R. Cornwell, Essentials of Entrepreneurship and Small Business Management, Pearson
2. H. Nandan, Fundamentals of Entrepreneurship 3rd Edition, PHI
3. Rishiksha T. Krishnan and Vinay Dabholkar, 8 Steps To Innovation : Going From Jugaad To Excellence
4. Peter Drucker, Innovation and Entrepreneurship
5. HBS series on Innovation and Entrepreneurship

## Semester III

### (PPM- 20001) Dissertation Phase – I

#### Teaching Scheme

Practical work 18 hr/week

#### Examination Scheme

Term Work & Oral Exam: -- 100 Marks

#### Course Outcomes:

Students will demonstrate the ability to:

1. Identify the case study for a practical problem from industry or research problem.
2. Carry out an extensive literature review will help them in understanding the latest happenings in the field.
3. understand and analyze the problem.

Project should be Industry requirements involving detail analysis or development of the industrial case studies related to Project Management as per the common instructions for all branches of M.Tech

#### \* Massive Open Online Course –I

- MOOC courses available during the academic year through SWAYAM or NPTEL
- Earlier MOOC courses available on various portals

### (SLM) Massive Open Online Course –I

#### (MOOC) (PPM-20002) Six Sigma

#### Teaching Scheme:

Self Learning Mode (SLM)

#### Examination Scheme

End-Sem Exam - 100

#### Course Outcomes:

At the end of the course, students will be able to

- understand fundamental concept of quality and TQM
- understand and apply six sigma principles
- Apply DMAIC methodology
- Analyze the issues and apply the improvement techniques and control it Management
- Use DMADV, DMADOV, and DFSS techniques

## **COURSE CONTENTS:**

### **QUALITY:FUNDAMENTALS AND KEY CONCEPTS**

Brief overview of the course, Quality concepts and definition, History of continuous improvement, Six Sigma Principles and Focus Areas , Six Sigma Applications  
Quality Management: Basics and Key Concepts , Fundamentals of Total Quality Management, Cost of quality, Voice of customer , Quality Function Deployment (QFD) Management and Planning Tools ,: Management and Planning Tools

**DEFINE**-Six Sigma Project Identification, Selection and Definition, Project Charter and Monitoring, Process characteristics and analysis, Process Mapping: SIPOC

**MEASURE** -Data Collection and Summarization Measurement systems: Fundamentals, Measurement systems analysis: Gage R&R study, Fundamentals of statistics, Probability theory, Process capability analysis: Key Concepts, Process capability analysis: Measures and Indices , Process capability analysis: Minitab Application, Non-normal process capability analysis

**ANALYZE** - Hypothesis testing: Fundamentals, Hypothesis Testing: Single Population Test, Hypothesis Testing: Two Population Test, Hypothesis Testing: Two Population: Minitab Application, Correlation and Regression Analysis, Regression Analysis: Model Validation, One-Way ANOVA, Two-Way ANOVA, Multi-vari Analysis, Failure Mode Effect Analysis (FMEA)

**IMPROVE**-Introduction to Design of Experiment, Randomized Block Design, Randomized Block Design: Minitab Application, Factorial Design, Factorial Design: Minitab Application, Fractional Factorial Design, Fractional Factorial Design: Minitab Application, Taguchi Method: Key Concepts, Taguchi Method: Illustrative Application

**CONTROL** -Seven QC Tools, Statistical Process Control: Key Concepts, Statistical Process Control: Control Charts for Variables, Operating Characteristic (OC) Curve for Variable Control charts, Statistical Process Control: Control Charts for Attributes Operating Characteristic (OC) Curve for Attribute Control charts, Statistical Process Control: Minitab Application, Acceptance Sampling: Key Concepts, Design of Acceptance Sampling Plans for Attributes, Design of Acceptance Sampling Plans for Variables, Acceptance Sampling: Minitab Application

**SIX SIGMA IMPLEMENTATION CHALLENGES**-Design for Six Sigma (DFSS): DMADV, DMADOV, Design for Six Sigma (DFSS): DFX, Team Management, Six Sigma: Case study, Six Sigma: Summary of key concepts

### **REFERENCES**

1. Roderick A. Munro and Govindarajan Ramu and Daniel J. Zrymiak, The certified six sigma Green Belt Handbook, ASQ Quality Press and Infotech Standards India Pvt. Ltd.
2. T. M. Kubiak and Donald W. Benbow, The Certified Six Sigma Black Belt Handbook, Pearson Publication.
3. Forrest W. Breyfogle III, Implementing Six Sigma, John Wiley & Sons, INC.
4. Evans, J R and W M Lindsay, An Introduction to Six Sigma and Process Improvement, CENGAGE Learning.



5. Howard S. Gitlow and David M. Levine, Six Sigma for Green Belts and Champions, Pearson Education, Inc.
6. Montgomery, D C. Design and Analysis of Experiments, Wiley.
7. Mitra, Amitava. Fundamentals of Quality Control and Improvement, Wiley India Pvt Ltd.
8. Montgomery, D C. Statistical Quality Control: A modern introduction, Wiley.
9. Prof. Jitesh J Thakkar, Six Sigma, IIT Kharagpur Swayam course.

## SEMESTER IV

### (PPM- 20003) Dissertation Phase – II

#### Teaching Scheme

Practical work 18 hr/week

#### Examination Scheme

Term Work & Oral Exam: -- 100 Marks

#### Course Outcomes:

1. Students will be able to apply the techniques learned during the course.
2. Student will be able to provide solution to the problem
3. Student will be in a position to publish their work in conference and Journals.

Project should be research oriented experimental work, involving detail analysis or development of the industrial case studies related to Project Management as per the common instructions for all branches of M.Tech.

#### \* Massive Open Online Course –II

- MOOC courses available during the academic year through SWAYAM or NPTEL
- Earlier MOOC courses available on various portals

## **(SLM) Massive Open Online Course –II**

### **(MOOC)(PPM-20004) Infrastructure Finance**

#### **Teaching Scheme:**

Self Learning Mode (SLM)

#### **Examination Scheme**

End-Sem Exam - 100

#### **Course Outcomes:**

At the end of the course, students will be able to

- understand basics of Infrastructure financing
- Analyze Project Viability and capital budgeting
- Analyze Project Finance Market
- Identify market risks and apply risk management techniques

#### **Course Contents:**

Introduction, Overview on Infrastructure Financing Sources, Basics of Financial Management,

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Analysis of company Performance, Analysis of Project Viability Time value of money

Analysis of Project Viability Cost of Capital

Analysis of Project Viability Capital Budgeting Techniques

Overview and introduction to project finance

Project Financing Attributes and Motivations

Project Finance Markets

Project Finance Markets- Mezzanine Sub-ordinated Debt

Type of Debt and Leasing

Financial Intermediation

Loan Refinancing, Project Bonds

Public Private Partnerships

Risk Management, Market Risks

Risk Management - Country Political risks

Context of Infrastructure Development

#### **Reference:**

1. Dr. A. Thillai Rajan, Infrastructure Finance -Department of Management Studies,IIT Madras, NPTEL Course
2. Akintoye,A.,Beck, M.,& Hardcastle, C.(Eds.).(2003).Public-Private Partnerships - Managing risks and opportunities. Oxford:Blackwell Science Limited.
3. Finnerty, J. D.(1996).Project financing - Asset-based financial engineering. New York: John Wiley & Sons, Inc.
4. Merna, T.,& Njiru, C.(2002). Financing infrastructure projects (First ed.). London: Thomas Telford.
5. Nevitt,P.K.,& Fabozzi, F. J.(2000).Project financing (7 ed.). London, UK:Euromoney Books.

6. Raghuram, G., Jain, R., Sinha, S., Pangotra, P., & Morris, S. (2000). Infrastructure Development and Financing: Towards a Public-Private Partnership: MacMillan.
  7. Tinsley, R. (2002). Project Finance in Asia Pacific: Practical Case Studies. London, UK: Euromoney Books.
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**(IOC) Interdisciplinary Open Course -SEM II  
(To be floated for other programmes)**

**(IOC) Project Planning and Control**

**Teaching Scheme**

Lectures : 3 hrs/week

**Examination Scheme**

T1/T2/ Assignments/ Quiz -40

End-Sem Exam- 60.

**Course Outcomes:**

At the end of course students will be able to :

- apply fundamental and technical knowledge of Project Planning.
- demonstrate leadership and decision making capabilities
- handle the project through project planning steps.
- analyze the projects through network techniques and handle financial aspects of project

**Course Contents:**

Function of Project Planning –Inter dependency relationship, Generation and screening of project ideas, project rating index, characterization of the market, demand forecasting, market planning. Financial Analysis: Estimation of cost of project and means of financing, estimates of sales and production, cost of production, working capital requirement and its financing, estimates of working results, breakeven points – projected cash flow statement, projected balance sheet. Project cash flows: Basic principles of measurement of cash flows, components of the cash flow streams – viewing a project from different points of view, definition of cash flows by financial institutions and planning commission, Forms of project organization, project planning, project control, human aspects of project management, prerequisites for successful project implementation. Project review and administrative aspects: Initial review, performance evaluation, abandonment analysis, administrative aspects of capital budgeting, evaluating the capital

budgeting system of an organization. Network techniques for project management, development of project network, time estimation, determination of critical path, scheduling when resources are limited, PERT and CPM models.

#### References:

1. Prasanna Chandra Project Planning: Analysis, Selection, Implementation and Review, Mc Graw Hill Education, 7<sup>th</sup> Edition 2009.
2. Narendra Singh, Project Management and Control, HPH, 2003
3. John M. Nicholas and Herman Steyn, Project Management for Business and Technology: Principles and Practice, Prentice Hall India, 2012
4. Clifford F. Gray & Eric W. Larson, Project Management: The Managerial Process, Tata Mc Graw Hill, 4<sup>th</sup> edition, 2010
5. Chitkara K K, Construction Project Management, Planning, Scheduling and Control, Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2010.
6. Meredith Jack R & Gopalan M.R, Project Management, Wiley India (P) Ltd. 2006
7. Harold Kerzner, Project Management A systems approach to Planning, Scheduling and Controlling, Wiley India, 10<sup>th</sup> Edition, 2009