

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY,
BELGAUM
SCHEME OF TEACHING AND EXAMINATION FOR
BE.-Industrial Engineering and Management (IM)**

VII Semester

CREDITBASED

Subject Code	Name of the Subject	Teaching hours/week		Duration of Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Practical / Field Work / Assignment/ Tutorials		I.A.	Exam		
15IM71	Facility planning and design	4	2	3	20	80	100	4
15IM72	Operations management	4	2	3	20	80	100	4
15IM73	Project management	4	2	3	20	80	100	4
15IM74X	Professional Elective	3	2	3	20	80	100	3
15IM75X	Open Elective	3	2	3	20	80	100	3
15IML76	Enterprise resource planning Lab	--	3	3	20	80	100	2
15IML77	Quality engineering lab	--	3	3	20	80	100	2
15IMP78	Project Phase-I + Seminar		3		100		100	2
Total		18	19	21	240	560	800	24

Professional Elective	
Sub. Code	Name of the Subject
15IM741	Marketing management
15IM742	Enterprise resource planning
15IM743	Strategic management
15IM744	Maintenance and safety engineering

Open Elective	
Sub. Code	Name of the Subject
15IM751	Financial Management
15IM752	World class manufacturing
15IM753	Product design and manufacturing
15IM754	Organizational behavior

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		Lecture	Practical / Field Work / Assignment/ Tutorials		I.A.	Exam		
15IM81	Supply chain management	4	2	3	20	80	100	4
15IM82	Total quality management	4	2	3	20	80	100	4
15IM83X	Professional Elective	4	2	3	20	80	100	4
15IM84	Internship/ Professional Practice	-	-	3	20	80	100	4
15IMP85	Project work Phase II							
15IMS86	Seminar	-	3	3	20	80	100	4
Total		12	09	15	120	400	500	20

Professional Elective	
Sub. Code	Name of the Subject
15IM831	Just in time Manufacturing
15IM832	Automation in manufacturing
15IM833	Lean manufacturing
15IM834	Automobile Engineering

VII SEMESTER

FACILITY PLANNING AND DESIGN

Subject Code	15IM71	No. of Credits	: 3 - 0 - 0
No. of Lecture Hours / Week	: 04	Exam Hours	: 3
Total No. of Lecture Hours	: 50	Exam Marks	: 80

COURSE OBJECTIVES

1. To know the importance of location, layouts and material handling
2. To know and distinguish between different approaches to layout and draw activity relationship chart
3. To compute space requirement and demonstrate skills in area allocation and construct the layout.
4. To examine the quantitative approaches to facility planning and identify the different models.
5. To know the different computerized techniques and model appropriate design.

COURSE CONTENT

UNIT-1

Plant Location: Factors influencing plant location, theories of plant location, plant layout – objectives of plant layout, principles of plant layout, types of plant layout, their merits and demerits, facilities design function: objectives. Simple exercises on layouts.

Introduction to Material Handling: Objectives and principles of material handling, unit load concept, Basic handling equipment types, Common material handling equipments

08 Hours

UNIT – 2.

Plant Design: Layout procedure, study of some approaches (Immer, Nadler, Muther, Apple James and Reed’s approach), systematic layout planning, the activity relationship chart, Constructing the activity relationship chart, Activity relationship diagram.

12 Hours

UNIT – 3

Space Determination and Area Allocation: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan.

Construction of the Layout: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management..

12Hrs

UNIT – 4

Quantitative approaches to facilities planning: Deterministic models, single and multi facility models, Conventional layout model: Block stacking, location allocation models,

Layout Models: Warehouse layout models, waiting line models, Storage models.

08 Hours

UNIT – 5

Computerized Layout Planning: Computerized relative allocation of facility techniques (CRAFT), Plant layout Evaluation Techniques (PLANET), Computerized Relationship Layout Planning (CORELAP), Comparison of computerized layout techniques.

10 Hours

COURSE OUTCOMES:

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

1. Identify the planning strategies for implementation, evaluation and maintaining the facility.
2. Arrive at suitable layout for given situations having understand different approaches.
3. Demonstrate the Space determination and area allocation procedure, construction of the layout.
4. Analyze the quantitative methods and models to determine for the plant location. Explain the warehouse and waiting line models.
5. Demonstrates the ideas on various types of layout and evaluation techniques using computers.

TEXT BOOKS

1. **Plant layout and material handling**- James M. Apple, 3rd edition John, Wiley and sons, 1991.
2. **Facility layout and location** – Françoise, R.L. and White, J.A, McGraw Hill 2nd edition, 1994.

REFERENCE BOOKS

1. **Practical layout** – Muther Richard -McGraw Hill-1956.
2. **Plant layout design** – James.M Moore, Mac Millon co.1962.
3. **Facilities design** –SundereshHeragu, PWS publishing company-ISBN-0-534-95183, August 2008
4. **Facilities planning** –Tompkins white –wiley India Pvt ltd 3rd edition.
5. **Facility Layout and Location**, Richard LFrancies. 2nd Edition PHI learning Pvt. Ltd

OPERATIONS MANAGEMENT

Subject Code: 15IM/IP72IA Marks : 20

No. of Lecture Hrs./ Week : 04 Exam Hours : 03

Total No. of Lecture Hrs. : 50

Exam Marks : 80

Module 1

OPERATIONS MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity.

OPERATIONS DECISION MAKING: Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology, Decision support systems, Economic models, and Statistical models. 10 Hours

Module 2

FORECASTING DEMAND: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts. 10 Hours

Module 3

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods. 10 Hours

Module 4

MATERIAL AND CAPACITY REQUIREMENTS PLANNING: Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES: Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control. 10 Hours

Module 5

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.

FLOW -SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic. **JOB-SHOP SCHEDULING:** Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines. 10 Hours

TEXT BOOKS:

1. Operations Management - Monks J.G. - McGraw-Hill International Editions - 1987.
2. Production and Operations Management - Pannerselvam. R – PHI – 2nd edition.
3. An introductory book on lean systems, TPS, Yasuhiro Monden

REFERENCE BOOKS:

1. Modern Production/Operations Management - Buffa - Wiely India Ltd. - 4th edition.
2. Production and Operations Management - Chary, S.N - TataMcGraw Hill. - 3rd edition
3. Production and Operatiosn Management – Adam & Ebert, PHI, 5th edition Financial Accounting And Costing

PROJECT MANAGEMENT

Subject Code	15IM73	No. of Credits	: 4 - 0 - 0
No. of Lecture Hours / Week	: 04	Exam Hours	: 3
Total No. of Lecture Hours	: 50	Exam Marks	: 80

COURSE OBJECTIVES

6. To know nuances of project management and explain project planning and estimating
7. To identify the importance of human resource component and apply project execution skills
8. To demonstrate project implementation using tools and techniques
9. To determine the necessary project direction and control activities
10. To evaluate the project performance for better performance.

COURSE CONTENT

UNIT-1

Project Management: Concepts, characteristics of project, phases of project life cycle

Project Planning and Estimating: Feasibility report, preparation of cost estimates, valuation of the project profitability

10 Hrs

UNIT – 2.

Organizing human resources and contracting: Delegation, project organization, Accountability in project execution, contracts, 3 'R's of contracting, Tendering and selection of contractors.

12 Hrs

UNIT – 3

Project implementation: Project work system design, work breakdown structure (WBS).

Tools and Techniques of Project Management: Project planning and scheduling techniques, bar (Gantt) chart, project evaluation and review technique

(PERT) planning – numerical.

12 Hrs

UNIT – 4

Project direction, Coordination and Control: Project communication, Project direction, Project co-ordination and Project control

08 Hrs

UNIT – 5

Project Management Performance: Performance indicators, The CM and DM companies for better project management

08 Hrs

COURSE OUTCOMES:

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

1. Recall the elementary concepts of projects and their management.
2. Plan and estimate a given project for its feasibility.
3. Organize human resources of a project and know the terms of contracting.
4. Select an appropriate tool/technique for project implementation.
5. Understand the knack behind directing, coordinating and controlling a project.
Evaluate a project for its performance and know the project management scenario in our nation.

TEXT BOOKS

1. **Project Management**, S.Choudhury Tata McGraw hill education PVT Ltd, 2013, 36th reprint.
2. **Project Management –A system approach to planning scheduling and controlling** - Harold Kerzner, 10th edition 2009, John wiley and sons.

REFERENCE BOOKS

1. **Project Management** Bhavesh M. Patel, Vikas Publication House, 2002.
2. **Project Planning Scheduling and Control**, James P. Lawis, Meo Publishing Company, 5th edition 2010.
3. **PERT and CPM**, L.S. Srinath, Affiliated East West Press Pvt. Ltd 2002.

MARKETING MANAGEMENT

Subject Code	: 15IIM 741	IA Marks	: 20
No. of Lecture Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lecture Hrs.	: 40	Exam Marks	: 80

MODULE - 1

INTRODUCTION: Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and

Macro Environment, importance of marketing in the India Socio – economics system.

CONSUMER MARKETS AND BUYING BEHAVIOR: Characteristics affecting consumer behaviour, Types of buying decisions, Buying decision process, Classification of consumer products, Market segmentation.

8 Hours

MODULE - 2

MARKETING INFORMATION SYSTEMS AND RESEARCH: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, measurement of market demand.

MARKETING OF INDUSTRIAL GOODS: Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behaviour, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users

8 Hours

MODULE- 3

PRODUCT PLANNING AND DEVELOPMENT: The concept of a product, features of a product, classification of products, product policies – product planning and development, product line, product mix – factors influencing change in product mix, product mix strategies, meaning of New – product; major stages in new – product development, product life cycle.

BRANDING, LABELLING AND PACKAGING: Branding, Reasons for branding, functions of branding, features and types of brands, kinds of brand name.

LABELLING: Types, functions, advantages and disadvantages

PACKAGING: Meaning, growth of packaging, function of packaging, kinds of packaging.

8 Hours

MODULE - 4

PRICING: Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions.

DISTRIBUTION: Marketing channels – functions, types of channels of distribution, number of channel levels. Physical distribution – importance, total systems concept, strategy, use of physical distribution.

8 Hours

MODULE-5

PERSONAL SELLING: Objectives of personal selling, establishing the Sales force objectives, sales – force strategy, sales force structure and size, salesmanship, qualities of good salesman, types of salesman, major steps in effective selling.

8 Hours

TEXT BOOKS:

1. **Principles of Marketing** - Philip Kotler - Prentice Hall - 11thEdn.
2. **Marketing Management** - Philip Kotler , Prentice Hall - 12thEdn.

REFERENCE BOOKS:

1. **Fundamentals of Marketing** - Wiliam J Stanton - McGraw Hill – 1994.
2. **Marketing Management Text & Cases** - Rajagopal- Vikas Publishing House - ISBN 81-259-0773-4.
3. **Marketing Management** - Michael R Czinkota - Vikas Publishing House - 2nd Edition ISBN 981-240-366-3.

ENTERPRISE RESOURCE PLANNING

Subject Code	: 15 IM 742	IA Marks	: 20
No. of Lecture Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lecture Hrs.	: 40	Exam Marks	: 80

MODULE - 1

INTRODUCTION TO ERP: Introduction, Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages being used now?

ENTERPRISE – AN OVERVIEW: Introduction, Integrated Management Information, Business modelling, Integrated Data Model.

7 Hours

MODULE - 2

ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.

ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP.Manufacturing Resource Planning, Distribution Requirements Planning.

13 Hours

MODULE - 3

KANBAN:JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.

ERP MODULES:Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

10 Hours

MODULE - 4

BENEFITS OF ERP:Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

ERP PACKAGES: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates,Inc. QAD

12 Hours

MODULE – 5

ERP Implementation Life Cycle: Pre-Evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, end user Training, Post Implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.

ERP- Case studies

8 Hours

TEXT BOOKS:

1. **Enterprise Resource Planning** - Alexis Leon - Tata McGraw Hill Publishing Company Ltd -1999.
2. **Enterprise Resource Planning Concept and Practice** -Vinod Kumar Garg and Venkitakrishnan- PrenticeHall, India - 2nd Edition.

REFERENCE TEXT BOOK:

1. **Manufacturing Planning & Controls** -Thomas Volloman, et.al.

STRATEGIC MANAGEMENT

Subject Code	: 15IM743	IA Marks	: 20
No. of Lecture Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lecture Hrs.	: 40	Exam Marks	: 80

MODULE- 1

STRATEGIC MANAGEMENT INTRODUCTION: Definition- Levels of strategy- Roles of Strategist- Strategic Management Process benefits and limitations. Mission- Objectives -Social responsibilities.

STRATEGY FORMULATION: Strategic Thinking, SWOT analysis- Techniques for environmental analysis- TOWS matrix, Balanced Score Card, Steps in strategy implementation -formulation of SBU strategy.

8 Hours

MODULE- 2

STRATEGY FORMULATION: Leadership implementation communicating the strategy- Annual and Functional objectives- Development of policies- Organisational Implementation- Evaluation and control. reward system.

STRATEGY AND STRUCTURE: Strategy- Structure relationship. Organizational restructuring and Transformation, Principles of Organization.

8 Hours

MODULE -3

STRATEGY EVALUATION AND CONTROL: Strategic control- Premise and Implementation control strategic Surveillance special alert control- Operational control-

Steps in Operational Control, Types of Operational control.

PORTFOLIO STRATEGY: Business portfolio analysis- BGC matrix, GE multi matrix, an evaluation of Portfolio models - factors influencing portfolio strategy.

8 Hours

MODULE - 4

COMPETITIVE ANALYSIS AND STRATEGIES: Structural analysis of industries threat of entry rivalry among existing competitors, threat of substitutes; Bargaining power of suppliers; structural analysis and competitive strategy -competitor analysis value chain.

7 Hours

MODULE - 5

BUSINESS GROWTH: Reasons, Risks and indicators of Business growth- Mergers and acquisitions. Management of M& A, determination of strategic purpose; screening, evaluation and choice, pitfalls in M&A, Defence strategies.

GLOBALIZATION: Meaning and Dimensions, Globalization of Indian business, Barriers to change, Implementation of marketing and change.

9 Hours

TEXT BOOKS:

1. **Strategic Management** - Francis Cherunilam - Himalya Publishers,
2. **Business Policy and Strategic Management** - AzharKazmi - Tata McGraw Hill -2ndEdn.
3. **Strategic Management** - Michael Porter - Prentice-Hall – 1984.

REFERENCE BOOKS:

1. **Business Policy and Strategic Management** - P SubbaRao - Himalya Publishers - 1st Edition.
2. **Corporate Strategic Management** -R.M.Srivastava, PragatiPrakashan ,Meerut - 1st Edition.
3. **Strategic Management** – Robert A Pitts and David Lei - Vikas Publishing House- 1st Edition.
4. **Business Environment for Strategic Management** - K.Aswantappa- Himalaya Publishers -1st Edition.

MAINTENANCE ENGINEERING AND SAFETY

Subject Code	15IM744	No. of Credits	: 3 - 0 - 0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 50	Exam Marks	: 80

COURSE OBJECTIVES

11. To know the nuances and importance of maintenance in modern Manufacturing organizations.
12. To recognize the importance of Maintenance Planning and Scheduling
13. To demonstrate skills learnt on maintenance of conventional machinery.
14. To identify the importance of Industrial safety and exhibit awareness of safety standards.
15. To identify the importance of housekeeping and manage industrial pollution

COURSE CONTENT

UNIT-1

Introduction to Maintenance: Objectives and Functions of maintenance. Factors influencing plant availability, Maintenance control, Maintenance Strategies, Organization for Maintenance. Failure Statistics: Breakdown time distributions, Poisson, Exponential and Normal Distributions., Failure Probability, Survival Probability and age specific failure rates.

12 Hrs

UNIT – 2.

Maintenance Planning and Scheduling: Planning and Maintenance Activities for Maintenance. Allocation of resources including manpower. Planning and scheduling techniques for maintenance. Estimation of Maintenance work. Repair complexity. Control of maintenance activity.

12 Hrs

UNIT – 3

Maintenance of Machinery: Causes of Machine failure. Performance evaluation, Trouble shooting, Lubrication Charts, Checklists for maintenance for conventional machines like Engine Lathes, Drilling machines, and Milling machines. Spare parts for maintenance and their inventory control

10Hrs

UNIT – 4

Industrial Safety: Economic and other importance of industrial accidents. Types of safety organizations, Analysis of Accident Records, Accident investigation. Safety standards for machines as well as Material handling equipment. Safety Standards for Electrical equipment, Classification of fires and fire fighting, Chemical hazards and handling.

08 Hrs

UNIT – 5

Housekeeping of buildings, Aisles, passages, floors, tool cribs, washrooms and canteen. Industrial pollution: effluents and their treatment, waste management. Environment control.

08 Hrs

COURSE OUTCOMES:

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

1. To recognize the importance of Maintenance Engineering and apply its principles.

2. To plan and Schedule the maintenance program for an given manufacturing organization.
3. To recall the nuances of maintaining simple conventional machines.
4. To know the safety standards for various hazards that are common on the shop floor
5. To express the importance of housekeeping discuss ways of handling industrial pollution

TEXT BOOKS

1. **Maintenance Engineering and Management** – R.C.Misra and K.Pathak- Prentice Hall of India 2002
2. **Maintenance Engineering- Principles, Practices and Management-** Sushil Kumar Srivastava, S.Chand and Co, New Delhi 2013

REFERENCE BOOKS

1. **Management of Industrial Maintenance-**A KELLY AND M J HARRIS Butterworth's Co, Ltd.,
2. **Maintenance, Replacement and Reliability-** AKS JARDINE,Pitman publishing Co.
3. **Maintenance planning and control-** A KELLY, Butterworth Co, Ltd.,

OPEN ELECTIVES

FINANCIAL MANAGEMENT

Sub Code	15IM/IP751	IA Marks	20
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	80

Course objectives:

1. To provide the concepts and foundations of managing finance in business enterprises.
2. To equip students with tools and techniques for managing finance.
3. To orient students regarding financial management practices in Indian companies and Global enterprises.

UNIT – 1

Introduction: Evolution of Financial Management, Goals, Forms of Business.

Risk and Required Return: Risk and return relationship, Business risk, financial risk, and risk in portfolio context, expected rate of return, Capital asset pricing model.

Capital Budgeting: Risk analysis in Capital Budgeting, Cost of Capital – Debt, Preference Equity forms of capital

08 Hours

UNIT – 2.

Capital Structure and Firm Value: Assumption, Definition and approaches, Modigliani and Miller Mode, Capital Structure decisions – EBIT, EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis.

Working Capital Management: Factors influencing working capital requirement, determination of operating cycle and working capital.
08 Hours

UNIT-3

Long Term Financing: Raising of finance form primary and secondary markets, Valuation of securities, features of convertibility securities and warrants, SEBI guide lines on capital issues, stock market in India, Venture capital, Initial Public Offering.

Merger Acquisition and Restructuring: Reasons, Mechanics, Cost and benefits of a merger, Evolution, terms and purchase of a division, Takeovers, Acquisitions, Portfolio and financial restructuring
08 Hours

UNIT – 4

Securities and Portfolio Analysis: Derivatives, Futures Trading,

Financial Statement Analysis: Ratio analysis, time series analysis, Du pont analysis, funds flow analysis

08 Hours

UNIT – 5

International Financial Management: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, Raising Foreign Currency Finance, Financing Exports, Documents in International Trade.

Financial Management in Sick Units: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness, Revival of a sick unit
08 Hours

TEXT BOOKS:

1. Financial Management Theory and practice – Prasanna Chandra – TMH – ISBN– 007-044501-X, 5th edn.
2. Financial accounting – B.S. Raman – United publication – VoI II

REFERENCE BOOKS:

1. Financial Management Text & Problems – Khan & Jain – TMH – ISBN 0—07-460208-X.
2. Financial management – IM Pandey – Vikas Pub. House – ISBN 0- 7069-5435-1.

WORLD CLASS MANUFACTURING SEMESTER-VII	
Course Code : 15IM/IP752	IA Marks : 20
Contact Hours/Week : 03	Exam. Hours : 03
Total Hours: 40	Exam. Marks : 80
CREDITS-03	

MODULE S	NO OF HRS
MODULE -1	
INTRODUCTION TO WORLD CLASS MANUFACTURING Manufacturing Excellence and Competitiveness, What is world-Class Manufacturing?-Halls framework of world-Class Manufacturing (WCM), Gunn s Model of World-Class Manufacturing, Maskells Model of World-Class Manufacturing. WORLD CLASS MANUFACTURING The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-The customers Interface ,The Supplier Interface, World-Class Practices in the factory.	09
MODULE -2	

<p>PRINCIPLES AND PRACTICES OF WCM Data collection plan, research-internal public domain sources, outside experts etc , original research, site visits, and code of conduct, Analyzing the gap: Top displaying data, deciding and combining best work practices, Balance Score Card Technique, Value Stream Mapping, validation, recommendations etc</p>	07
MODULE -3	
<p>BENCHMARKING Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process , What to benchmark: concept of step zero, priorities, business processes linking to goals etc, investigation, documentation, performance measures, improving business processes , Whom to benchmarks: Developing candidate list, systematic search, refining the initial list</p>	07
MODULE -4	
<p>DEFINITION OF REENGINEERING Importance of 3Cs-customers takes charges, competition intensifies, and change becomes constant , Definition of Business Process Reengineering fundamentals rethinking, radical redesign, and dramatic improvement Rethinking business process, new world of and enabling role of information technology</p> <p>QUALITY MANAGEMENT SYSTEMS ISO 9000-2000, IS 14000, Frame Work for Business Excellence - Malcolm Baldrige Award, Deming's Award</p>	09
MODULE -5	
<p>SIX SIGMA The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line , core of DFSS-IDOV method , DFSS Metrics, DFSS Infrastructure People and resources, Implementing DFSS</p> <p>ACTIVITY BASED MANAGEMENT (ABM) Introduction, Traditional Cost Systems, Activity Based activity Based Costing, Activity Based Management, ABM Implementation, Case Study.</p>	08

Course Outcomes: On completion of this course, students are able to:

1. Understanding the need for learning the world class manufacturing setup.
2. Learn the principles and practices of world class manufacturing.
3. Determine the quality practices as applied to world class product.
4. Standard practices of quality of conformance systems.

Text Books:

1. **World Class Manufacturing- A Strategic Perspective** – Sahay B S, Saxena K B C, Ashish Kumar – MacMillan India Ltd – ISBN 0333-93-4741. (unit 1 & 2)
2. **Finding and Implementing Best Practices- Business Process Benchmarking** - Champ, Robert C. – Vision Books, New Delhi – 2008.(unit 3 & 4)
3. **Reengineering the corporation – A Manifesto for Business revolution** – Hammer, Michael and James Champy – Nicholas Brealey Publishing , London.- 1993(unit 5 & 6)
4. **Six sigma for Managers-** Greg Brue – TMH – ISBN- 0-07-048639- 5 -2002.(unit 7)

Reference Books:

1. **Design for Six Sigma** –Grege – TMH – ISBN 0-07-058120. – 2003.
2. **Design for Six Sigma Technology and Product Development** – Creveling -Pearson Education – 2008.
3. **Total Quality Management** -Dale H. Besterfield, carol Besterfield- Minchna, glen H Besterfield and Mary Besterfield scare – Pearson education – 3rd edition – ISBN 81-297-0260-6 (Part of Unit 6)
4. **Total Quality Management** – Kesavan R – I K International Publishing house Pvt. Ltd – 2008

Question paper pattern:

1. The question paper will have **ten** full questions carrying equal marks. Each full question consisting of **16** marks
2. There will be **two** full questions from each module.
3. Each full question will have questions covering all the topics under a module.
4. The students will have to answer **five** full questions, selecting **one** full question from each module.

PRODUCT DESIGN & MANUFACTURING

Sub Code	15IM753	IA Marks	20
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	80

Course objectives:

1. Understanding the management role in the investigation, implementation and operation of manufacturing systems for efficiency, cost effectiveness and quality of product.
2. To match the manufacturing techniques with the product, company and the market.
3. To develop a flexible systems approach to originating, adapting, and developing processes and systems to meet the changing technology.

UNIT – 1

Introduction to Product Design: Asimow's Model: Definition of Product Design, Design by Evolution; Design by Innovation, Essential Factors of Product Design, Production-Consumption Cycle, Flow and Value Addition in the Production-consumption Cycle, The Morphology of Design (The seven phases), Primary Design Phases and flowcharting, Role of Allowance, Process Capability, and Tolerance in Detailed Design and Assembly.

08 Hours**UNIT – 2.**

Product Design Practice And Industry: Introduction, Product Strategies, Time to Market, Analysis of the Product, The Three S's,

Standardization, Renard Series (Preferred Numbers), Simplification, The Designer and His Role, The Designer: Myth and Reality, The Industrial Design Organization, Basic Design Considerations, Problems faced by Industrial Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers, What the Designer contributes, Role of Aesthetics in Product Design, Functional Design Practice

08 Hours

UNIT-3

Review of Strength, Stiffness and Rigidity considerations in Product Design: Principal Stress Trajectories (Force - Flow Lines), Balanced Design, Criteria and Objectives of Design, Material Toughness: Resilience, Designing for Uniform Strength, Tension visavis-compression

08 Hours

UNIT – 4

Economic Factors Influencing Design: Product Value, Design for Safety, Reliability and Environmental Considerations, Manufacturing Operations in relation to Design, Economic analysis, Profit and Competitiveness, Break-even Analysis.

08 Hours

UNIT – 5

Value Engineering and Product Design: Introduction, Historical Perspective, What is Value? Nature and Measurement of Value, Maximum Value, Normal Degree of Value, Importance of Value, The Value Analysis Job Plan, Creativity, Steps to Problem-solving and Value Analysis, Material and Process Selection in Value Engineering

Modern Approaches to Product Design: Concurrent Design, Quality Function Deployment (QFD), Implementation of QFD in production.

08 Hours

TEXT BOOKS:

1. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, PHI.
2. Product Design & Development - Karl T. Ulrich & Steven D., TataMcGraw Hill, 3'd Edition, 2003

REFERENCE BOOKS:

1. New Product Development by Tim Jones, Butterworth Heinemann, Oxford, UIC 1997. .

2. New Product Development: Design & Analysis by Roland Enene, Kinetovicz, John Wiley and Sons Inc., N. Y. 1990.
3. Product Design for Manufacture and Assembly by Gefferry Boothroyd, Peter Dewhurst and Winston Knight. '.
4. Successful Product Design by Jill Hollins, Stwout Pugh, Butterworth, London J 990.

ORGANIZATIONAL BEHAVIOR

Subject Code	: 15IM754	No. of Credits	: 3 - 0 - 0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 40	Exam Marks	: 80

COURSE OBJECTIVES

1. To know and recognize the importance of human behavior at work in organizations.
2. To relate human behavior with learning and demonstrate how the two go together.
3. To recognize the importance of motivation in learning and other performance attributes.
4. To know and locate the importance of group interactions and group behavior in organizations.
5. To manage and resolve conflicts through effective communication.

COURSE CONTENT

UNIT – 1

Introduction: Definition of Organization Behavior and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

The Individual: Foundations of individual behavior, individual differences. Ability. Attitude, Aptitude, interests. Values – Types of Values, Changing Values.

8 Hours

UNIT – 2

Learning: Definition, theories of learning, individual decision making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.

Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect.

8 Hours

UNIT – 3

Motivation: Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Herzberg's motivation Hygiene theory, David McClelland's three needs theory, Victor Vroom's expectancy theory of motivation.

08 Hours

UNIT – 4

Groups Behavior: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making.

8 Hours

UNIT – 5

Conflict & Stress Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process. Sources of stress, fatigue and its impact on productivity. Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process.

Communication: Principles of Communication: Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication.

8 Hours

COURSE OUTCOMES:

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

1. Appreciate human behavior at work.
2. Demonstrate how learning depends on behavioral aspects.
3. Value motivation and work and demonstrate their motivational skills.
4. To identify themselves as a part of a group and perform well.
5. To manage organizational conflict and be able to produce results.

TEXT BOOKS

1. **Organizational Behaviour**, Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002.
2. **Organizational Behaviour**, Fred Luthans, 9th Edition, Mc Graw Hill International Edition, ISBN-0-07-04-002.

REFERENCE BOOKS

1. **Organizational Behaviour**, Aswathappa - Himalaya Publishers, 2001.
2. **Organizational Behaviour**, (Human behaviour at work) 9th Edition, John Newstrom/ Keith Davis, 2002.
3. **Organizational Behaviour**, Hellriegel, Srocam and Woodman, Thompson Learning, 9th Edition, Prentice Hall India, 2001.
4. **Organizational Behaviour**, VSP Rao and others, Konark Publishers, 2002.

ENTERPRISE RESOURCE PLANNING LAB

Subject Code	:	15IML 76	IA Marks	:	20
No. of Lab Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hrs.	:	42	Exam Marks	:	80

PART - A

1. Process of customer orders under seasonal / unseasonable and Blanket orders.
2. Generating Bill of Materials for Various Engineering Designs
3. Creating Item Master for various Engineering Designs
4. Conduction of vendor Evaluation exercise
5. Basic Statistical Analysis
6. Creating Purchase order for Items
7. Creating Work order for Items
8. Perform inventory transaction

PART - B

1. Creating quotation process for Items
2. Creating Dispatch Instruction for Items
3. Creating Payment reconciliation.
4. MRP - II Generating of Various reports for confirmed orders
5. Basic statistical analysis
6. Analyse of existing capacity and defining routes optimizing the resources along routes.
7. Optimization problems using OR packages (two exercises only).
8. Scheduling of activities

Suggested Software Packages

1. Statistical Packages : SYSTAT / MINITAB / SPSS and such others
2. ERP Packages: SIXTH SENSE / RAMCO / MAARSMAN / CIMAS / UNISOFT / OPTIMIIZER 10.6 and such others.
3. Preactor – Scheduling Software OR Packages : Lindo / Lingo / STORM / such others

Note: A minimum of 12 exercises are to be conducted.

QUALITY ENGINEERING LAB

Subject Code	: 15IML 77	IA Marks	: 20
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 80

PART - A

To test the Goodness of fit for the given quality characteristic using: Uniform distribution, Binomial distribution, Poisson distribution & Normal distribution.
 Conduction of Repeatability and Reproducibility studies for appraiser and instrument using R&R Software
 Assessing Process Capability of the given manufacturing process using Normal Probability paper method and process capability indices
 Assessing Process Capability of the given manufacturing process using Digital Motorized Multifunctional Height Gauge and SQC Display unit

PART – B

1. Experiments on Application of 7 QC Tools as applied to Manufacturing and Service Operations.
2. Construction of control chart for variable quality characteristic using
3. Digital Motorized Multifunctional Height Gauge
4. SQC Display unit
5. SQC/SPC software
6. Construction of control chart for attribute quality characteristic
7. Construction of control charts using SYSTAT Software
8. Attribute sampling Plans – Single, Double and Multiple sampling plans.
9. Experiments on correlation and Simple linear regressions
10. Experiments on multiple linear regressions
11. Conduction of Design of Experiments – Full Factorial approach for the given quality characteristic for machining operations.
12. Exercises to demonstrate Taguchi's Orthogonal Array technique through DOE software.
13. Exercises on FMEA and Reliability
14. Exercises on QFD

Note: A minimum of 12 exercisers are to be conducted

REFERENCE BOOKS:

1. **Introduction to statistical Quality Control** - D C Montgomery - John Wiley and Sons - 3rd Edition.
2. **Quality Planning & Analysis**- J M Juran, Frank M Gryna - Tata McGraw Hill - 3rdedn.

VIII SEMESTER

SUPPLY CHAIN MANAGEMENT

Subject Code	:	15IM/IP81	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE - 1

BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS: Supply chain stages and decision phase, process view of a supply chain. Supply chain flows. Examples of supply chains.Competitive and supply chain strategies.Achieving strategic fit.Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information.Obstacles to achieving fit, Case discussions.

DESIGNING THE SUPPLY CHAIN NETWORK: Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

11 Hours

MODULE - 2

FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision trees. Analytical problems.

PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Review of inventory concepts.,Concepts of Safety Inventory, Concept of Aggregation of Inventory, Concept of product availability.

11 Hours

MODULE - 3

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

Role of transportation, Factors affecting transportation decisions.Modes of transportation and their performance characteristics.Designing transportation network.Trade-off in transportation design.Tailored transportation, Routing and scheduling in transportation.International transportation.Analytical problems. Role of Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

11 Hours

MODULE- 4

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

The role of IT 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 discussion.

10 Hours

MODULE-5

EMERGING CONCEPTS: Reverse Logistics, Reasons, Activities, Role.RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

7 Hours

SUGGESTED TEXT BOOK:

1. **Supply Chain Management – Strategy, Planning & Operation** - Sunil Chopra & Peter Meindl - Pearson Education Asia - ISBN: 81-7808-272-1. – 2001.

REFERENCE BOOKS:

1. **Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems** - Robert B Handfield, Ernest L Nichols, Jr. - Pearson Education Inc - ISBN: 81-297-0113-8. - 2002.
2. **Modelling the Supply Chain** -Jeremy F Shapiro, Duxbury - Thomson Learning – ISBN 0-534-37363. -2002.
3. **Designing & Managing the Supply Chain** -David Simchi Levi, Philip Kaminsky& Edith Simchi Levi - McGraw Hill.
4. **Supply Chain and Logistics Management** – UpendraKachuru

TOTAL QUALITY MANAGEMENT

Subject Code	:	15IM82	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE - 1

OVERVIEW OF TOTAL QUALITY MANAGEMENT: History of TQM. Axioms of TQM, contributions of Quality Gurus – Deming’s approach, Juran,s quality trilogy, Crosby and quality treatment, Imai’s Kaizen, Ishikawa;scompany wide quality control, and Fegenbaum;s theory of TQC, QFD.

10 Hours

MODULE- 2

EVOLUTION OF QUALITY CONCEPTS AND METHODS: Quality concepts. Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design from deviations to weaknesses to opportunities. Future fitness’s,

FOUR REVOLUTIONS in management thinking, and four levels of practice

10 Hours

MODULE - 3

FOCUS ON CUSTOMERS; Change in work concept marketing, and customers.

CONTINUOUS IMPROVEMENT: Improvement as problem solving process; Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity.

REACTIVE IMPROVEMENT; Identifying the problem, standard steps and tools, seven steps case study, seven QC tools.

10 Hours

MODULE- 4

PROACTIVE IMPROVEMENT: Management diagnosis of seven steps of reactive improvement. General guidelines for management diagnosis of a QI story, Discussion on case study for diagnosis of the seven steps. Proactive Improvement; Introduction to proactive improvement, standard steps for proactive improvement, semantics, example-customer visitation, Applying proactive improvement to develop new products- three stages and nine steps.

TOTAL PARTICIPATION: Teamwork skill. Dual function of work, teams and teamwork, principles for activating teamwork, creativity in team processes, Initiation strategies, CEO involvement Example strategies for TQM introduction

10 Hours

MODULE- 5

INFRASTRUCTURE FOR MOBILIZATION: Goal setting (Vision/ Mission), organization setting, training and E education, promotional activities, diffusion of success stories, awards and incentives monitoring and diagnosis, phase-in, orientation phase, alignment phase, evolution of the parallel organization.

HOSHIN MANAGEMENT: Definition, phases in hoshin management-strategic planning (proactive), hoshin deployment Hoshin management versus management by objective,

SOCIETAL NETWORKING: Networking and societal diffusion – Regional and nationwide networking, infrastructure for networking, openness with real cases, change agents.

10 Hours

TEXT BOOKS:

1. **A New American TQM Four Practical Revolutions in Management** - Shoji Shiba, Alan Graham and David Walden – Productivity Press, Portlans (USA) -1993.
2. **Management for Total Quality** - N Logothetis- Prentice Hall of India, New Delhi - 1994.(1st Chapter)

REFERENCE BOOK:

1. **The Quality Improvement Hand Book** -Roger C Swanson - Publisher Vanity Books International, New Delhi - 1995.
2. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd – 2008.

PROFESSIONAL ELECTIVE
JUST IN TIME MANUFACTURING

Subject Code : 15IM831 IA Marks : 20
No. of Lecture Hrs./ Week : 03
Total No. of Lecture Hrs. : 40

Exam Hours : 03
Exam Marks : 80

MODULE 1

JIT-AN INTRODUCTION: Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, enabling JIT to occur, basic element of JIT, benefits of JIT.

MODERN PRODUCTION SYSTEM: Key feature of Toyota's production system, basic framework of Toyota production system. **KANBAN SYSTEM** – other types of kanban's, kanban rules, determining the number of kanban's in Toyota production system. 8
Hours

MODULE 2

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM: production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line to realize smoothed production. EDP system for support of the Toyota Production system.

GLOBAL IMPLEMENTATION OF JIT: JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, conclusion.
8 Hours

MODULE 3

JIT IMPLEMENTATION SURVEYS: JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time production in Hong Kong electronics industry, conclusion.

DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system with conventional "push type" planning and control systems, quality management system for JIT, product design for JIT human resource management in JIT, flexible workforce system at Toyota.

8 Hours

MODULE 4

SUPPLY MANAGEMENT FOR JIT: JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, Quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing.

8 Hours

MODULE 5

FRAMEWORK FOR IMPLEMENTATION OF JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion. **8 Hours**

TEXT BOOKS:

1. **Just In Time Manufacturing** - M.G. Korgaonker – Macmillan India Ltd.- 1992
2. **Japanese Manufacturing Techniques** - Richard J. Schonberger - The Free Press – Macmillan Pub. Co., Inc. New York - 1988.

AUTOMATION IN MANUFACTURING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
Automation In Manufacturing	15IM/IP832	3	3-0-0	SEE	CIA	3 Hrs
				80	20	

Course Learning Objectives

CLO-1	To understand the concepts of automation in manufacturing systems
CLO-2	To impart the knowledge of a line balancing and assembly systems
CLO-3	To explore the idea of robotics and understand the computerized manufacturing planning
CLO-4	To gain the knowledge of automated inspection and shop floor control
CLO-5	To understand the concepts of additive manufacturing and latest trends in

Module -1

Introduction: Production system facilities, Manufacturing support systems, Automation in production systems, Automation principles & strategies

Manufacturing Operations: Manufacturing operations, Product/production relationship, Production concepts and Mathematical models & costs of manufacturing operations. Problems on mathematical models **8 Hrs**

Module -2

Line Balancing: Methods of line balancing, Numerical problems on largest candidate rule, Kilbridge's and Wester's method, and ranked positional weights method, computerized line balancing methods.

Automated Assembly System: Design for automated assembly, types of automated assembly system, Parts feeding devices, Analysis of single and multi station assembly machines. **8 Hrs**

Module -3

Computerized Manufacture Planning and AGVS: Computer aided process planning (CAPP), Retrieval and Generative systems, and benefits of CAPP. Material requirement planning, Inputs to MRP system, working of MRP, Outputs and benefits. Automated Guided Vehicles System: Applications, Guidance and routing,

Industrial Robotics: Definition, Robot anatomy, Joints and links, Robot configurations, Robot control systems, Accuracy and repeatability, End effectors, Sensors in robotics. Industrial robot applications: Material handling, Processing, assembly and inspection. **9Hrs**

Module -4

Inspection Technologies: Automated inspection, coordinate measuring machines construction, Operation & programming, Software, application & benefits, Flexible inspection system, Inspection probes on machine tools, Machine vision, Optical inspection techniques & Non-contact Non-optical inspection technologies.

Shop Floor Control and Automatic Identification Techniques: Shop floor control, Factory data collection system, Automatic identification methods, Bar code technology, Automatic data collection systems. An Introduction to QR Code Technology **9 Hrs**

Module -5

Additive Manufacturing Systems: Basic principles of additive manufacturing, Slicing CAD models for AM, Advantages and limitations of

AM technologies, Recent trends in manufacturing, Hybrid manufacturing.

Future of Automated Factory: Trends in manufacturing, the future automated factory, Human workers in future automated factory, Social impact. **8 Hrs**

Text Books:

1. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 3rd Edition, 2009, PHI Learning.
2. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 1999, Prentice-Hall of India.
3. CAD / CAM Principles and Applications by P N Rao, 3rd Edition, 2015, TataMcGraw-Hill.
4. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 2nd Ed. (2015), Ian Gibson, David W. Rosen, Brent Stucker
5. “Understanding Additive Manufacturing”, Andreas Gebhardt, Hanser Publishers, 2011

Reference Books:

1. Systems Approach to Computer-Integrated Design and Manufacturing by Dr.Nanua Singh,Wiley, 1996.
2. CAD/CAM/CIM P. Radhakrishnan, S. Subramanyan, U.Raju, New Age International Publication Revised Third Edition 2007.

Course Outcome

After studying this course, students will be able to:

CO-1	Explain the basics of productions, automation system and manufacturing operations. Solve the simple problems on mathematical model.
CO-2	Analyze and solve problems on line balancing
CO-3	Explain CAPP and MRP system and analyze the AGVS
CO-4	Understand the inspection technologies and shop floor control
CO-5	Explain the modern trends in additive manufacturing and automated factory

LEAN MANUFACTURING
15IM833

Sub Code

IA Marks

20

No. of Lecture Hrs/week	04	Exam Hours	03
Total Lecture Hrs	50	Exam Marks	80

Course objectives:

1. To enable students to design a globally competitive manufacturing organization using lean manufacturing principles;
2. To develop the skills to implement lean manufacturing in industry and manage the change process to achieve continuous improvement of efficiency and productivity.

UNIT – 1

Just in time production system. JIT Logic -Pull system Japanese approach to production elimination of waste - JIT implementation requirements JIT application for job shops, Case studies

Kanban system:-Kanban rules, supplier Kanban and sequence schedule used by supplier, Monthly information & daily information. Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table -problems & counter measures in applying Kanban system to subcontractors -Supplier Kanban circulation in the paternal manufacturer -structure of supplier Kanban sorting office.

10 Hours

UNIT – 2.

The rise of mass production: The rise & fall of Mass Production Mass production, work force, organization, tools, product –logical limits of mass production, Sloan as a necessary compliment to Ford. Case study:- Rouge Production Plant.

The rise of lean production: - Birth place, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer and future of lean production

10

Hours

UNIT-3

Shortening of production lead times -reduction of setup times, practical procedures for reducing setup time.

Standardization of operations.Machine layout, multi-function workers and job rotation. Improvement activities to reduce work force and increase worker morale -foundation for improvements

10 Hours

UNIT – 4

Elements of lean production viz G M Framingham -Toyota Takaoka Mass Production V /s lean production, diffusing lean production.

Managing lean enterprise:- Finance, Career ladders, geographic spread and advantages of global enterprise.

10 Hours

UNIT – 5

Six sigma concepts: History, definitions, Statistical definitions, quality levels, Technical aspects, Six sigma for all: benefits to organizations, customers, suppliers and employers, Design for Six Sigma, DMAIC principles, DMADV principles, merits and demerits **10 Hours**

REFERENCE BOOKS:

1. **Productions and Operations Management** – ChaselAquilino - 10th Edition.
2. **Toyoto Production System -An integrated approach to Just in Time** - Yasuhiro Monden, - Engineering aild Management Press -Institute of Industrial Engineers – 1983.
3. James P Womack, Daniel T Jones, and Daniel Roos, **“The Machine that changed the World. The Story of Lean Production** -Harper Perennial edition published 1991.
4. **Quality Function Development** - James Bossert - ASQC Press 1991.
5. **Straight talk on design of experiments** - Launshy and Weese.
6. **Quality control:** Kulkarni V A &Bewoor A K, Wiley India.

AUTOMOBILE ENGINEERING

Subject Code	15IM834	No. of Credits	: 3 - 0 - 0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 40	Exam Marks	: 80

COURSE OBJECTIVES

16. To identify and name the various parts of an automobile.
17. To recognize the effects and types of Superchargers and Turbochargers.
18. To identify the various components of an Ignition System and know their functions
19. To describe the Transmission system and know the use .
20. To explain the modes of power transmission and indicate the types of braking

UNIT-1

Engine Components and Cooling & Lubrication systems: cylinder - arrangements and their relatives merits, cylinder Liners, Piston rings, connecting rod, crankshaft, valves, cooling requirements, Methods of cooling- lubrication system and Different lubrication methods.

08 Hrs

UNIT – 2.

Super Chargers And Turbochargers: Naturally aspirated engines, Forced Induction, Supercharging of SI Engines and CI Engines, Effects of supercharging on performance of the engines, supercharging limits. Methods of supercharging, Types of superchargers, Turbocharger construction and operation.

08Hrs

UNIT – 3

Ignition Systems: Introduction, Requirements of an ignition system, Battery Ignition systems components of Battery Ignition systems, magneto Ignition system- rotating armature type, rotating magnet type, Electronic Ignition system

08 Hrs

UNIT – 4

Transmission Systems: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, and Single plate, multi-plate and centrifugal clutches.

Gear Box - Principle of gear box, Sliding mesh gear box, constant mesh gear box, synchromesh gear box and Epicyclical gear box, over drives, fluid coupling and torque converters, principle of automatic transmission

08Hrs

UNIT – 5

Drive To Wheels: Propeller shaft, universal joints, differential, rear axle drives, Hotchkiss and torque tube drives, steering geometry, power steering,

Brakes: Types of brakes, Disk brakes, drum brakes, Hydraulic brakes and Air brakes, Antilock -Braking systems, purpose and operation of antilock-braking system

08Hrs

COURSE OUTCOMES:

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

1. Explain functions of piston and piston rings, valves, cooling system and lubrication system.
2. Differentiate between supercharger and turbocharger and their respective constructions.
3. Understand the working principles of various ignition methods used and their operations.
4. Develop the knowledge on different energy transmission systems and their applications.
5. Develop the knowledge on steering types and different braking methods.

TEXT BOOKS

1. **Automotive Mechanics**, S. Srinivasan, Tata McGraw Hill 2003.
2. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

REFERENCE BOOKS

1. **A course in I.C. Engines**, M.L. Mathur and R.P. Sharma 2001
2. **Internal Combustion Engines**, Ganeshan, Tata McGraw Hill, 2ndEdition, 2003.