UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
VIII SEMESTER
MECHANICAL - STREAM - INDUSTRIAL ENGINEERING
### SCHEME -2013

**VIII SEMESTER**

**MECHANICAL - STREAM - INDUSTRIAL ENGINEERING (N)**

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>13.801</td>
<td>Industrial Scheduling (N)</td>
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<td>13.803</td>
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<td>Creativity and Product Development (N)</td>
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<td>2 1</td>
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<tr>
<td>13.805</td>
<td>Elective IV</td>
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<td>13.806</td>
<td>Elective V</td>
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<td>13.808</td>
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| Total     | 29 16 6 7 500                                       | 700     | 1200               |

#### 13.805 Elective IV

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
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<tbody>
<tr>
<td>13.805.1</td>
<td>Artificial Intelligence and Neural Networks (N)</td>
</tr>
<tr>
<td>13.805.2</td>
<td>Marketing Management (N)</td>
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<tr>
<td>13.805.3</td>
<td>Design and Analysis of Algorithms (N)</td>
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<td>13.805.4</td>
<td>Managerial Economics (N)</td>
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<td>13.805.5</td>
<td>Multi-criteria Decision Making (N)</td>
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<td>13.805.6</td>
<td>Facilities Design and Planning (N)</td>
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#### 13.806 Elective V

<table>
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<tr>
<th>Course No</th>
<th>Name of subject</th>
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<tr>
<td>13.806.1</td>
<td>Flexible Manufacturing Systems (N)</td>
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<tr>
<td>13.806.2</td>
<td>Agile and Lean Manufacturing (N)</td>
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<tr>
<td>13.806.3</td>
<td>Total Quality Management (N)</td>
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<td>13.806.4</td>
<td>Business Process Reengineering (N)</td>
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<tr>
<td>13.806.5</td>
<td>Econometrics (N)</td>
</tr>
<tr>
<td>13.806.6</td>
<td>Human Factors in Engineering (N)</td>
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</table>
Course Objectives:

- Develop knowledge on scheduling and techniques for minimizing flow time.
- Understand scheduling methodologies for single machine and parallel machine models.
- Acquire knowledge on advanced scheduling methodologies for flow shop and job shop.

Module – I

Introduction to scheduling, role of scheduling, Terminologies involved in scheduling. Single Machine Models - Problems without due dates – Minimizing mean flow time, Minimizing weighted mean flow time. Problems with due dates – Lateness criteria, Minimizing the number of Tardy jobs, Hodgson’s Algorithm, minimizing Mean Tardiness, The Wilkerson-Irwin Algorithm.

Module – II


Module – III


Module – IV


References:


**Internal Continuous Assessment Pattern:** *(Maximum Marks: 50)*

50% - Tests *(minimum 2)*

30% - Assignments *(minimum 3)* such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

**Course outcome:**

- Knowledge on the role of scheduling and techniques for minimizing flow time.
- Understanding on scheduling methodologies for single machine and parallel machine models.
- Knowledge on advanced scheduling methodologies for flow shop and job shop.
Course Objectives:

- To educate students on different measurement systems and on common types of errors.
- To give knowledge about thermocouples, thermometers and flow meters used for measurements.
- To introduce measuring equipments used for linear and angular measurements.
- To familiarize students with surface roughness measurements on machine components.

Module – I


Module – II


Module – III

Module – IV


References:


Internal Continuous Assessment: (Maximum Marks-50)

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

- Students will be able to work in Quality control and quality assurances divisions in Industries
- Students will be able to design measuring equipments for the measurement of temperature and flow.
Course Objectives:

- To provide preliminary knowledge of various topics related to mathematical finance.
- To provide the students a basic understanding of interest theory and various derivatives and its pricing aspects.
- To create interest among students in the study of mathematical concepts applied to finance.

Module – I

The Basic theory of interest: - Principal and Interest – Simple interest, Compound interest, Frequent and Continuous compounding. Present and Future value of streams – Future value, Present value, Net Present Value, Internal Rate of Return. Bond Return and Valuation: - Bond basics, Bond risk, Bond return, Yield to maturity, Bond value theorems, Convexity, Yield curve, Duration, Immunization.

Module – II


Module – III


Module – IV

References:


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests *(minimum 2)*

30% - Assignments *(minimum 2)* such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern: *(Maximum Marks: 100)*

*Examination duration: 3 hours*          *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

*Note:* If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

*After the completion of this course, the student shall be able to:*

- Understand various terminologies and processes related to bond and derivatives market.
- Build careers in the mathematical applications in financial sector, which is an upcoming area in recent times.
13.804 CREATIVITY AND PRODUCT DEVELOPMENT (N)

Teaching Scheme: 2(L)-1(T)-0(P)  
Credits: 3

Course Objectives:

- To provide the students a set of tools and methods for product design and development.
- To make the students aware of the role of multiple functions in new product creation.
- To introduce students to design thinking techniques and new creativity skills.

Module – I


Module – II


Module – III


Module – IV

Identifying customer needs: - Quality Function Deployment (QFD), Concept generation methods, Idea generation methods, Information sources for concept generation. Intellectual property – Concept of Intellectual property, Kinds of Intellectual property, IPR in India. Patents: - Definition, granting, infringement, searching and filing. Copyrights: - Definition,
granting, infringement, searching and filing. Trademarks and their role in commerce. Crowd sourcing and Open innovation.

References:


**Internal Continuous Assessment Pattern:** *(Maximum Marks: 50)*

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 3) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.
Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

After the completion of this course, the student shall be able to:

- Use the creativity techniques to come up with new product ideas.
- Coordinate multiple, interdisciplinary tasks to achieve a common objective.
13.805.1 ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS (N) (Elective IV)

Teaching Scheme: 3(L)-1(T)-0(P)  
Credits: 4

Course Objectives:

- To identify problems that can be expressed in terms of search problems or logic problems and translate into an appropriate form so as to address using an algorithmic approach.
- To express problems in terms of neural networks and to select an appropriate learning methodology for the problem area.

Module – I


Module – II


Module – III


Module – IV

References:


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: *(Maximum Marks: 100)*

*Examination duration: 3 hours Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

After the completion of this course, the student shall be able:

- To identify problems that can be expressed in terms of search problems or logic problems and translate into an appropriate form so as to address using an algorithmic approach.
- To express problems in terms of neural networks and to select an appropriate learning methodology for the problem area.
13.805.2 MARKETING MANAGEMENT (N) (Elective IV)

Teaching Scheme: 3(L)-1(T)-0(P)  
Credits: 4

Course Objectives:

- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling.

Module – I


Module – II


Module – III


Module – IV

Introduction to International Marketing Management: Overview, International economic institutions, foreign markets, export pricing and finance, India’s trade policy. Web enabled Marketing features – specific characteristics and components of marketing mix under web enabled environment.

References:

1. Philip Kotler, Marketing Management (Millennium edition), PHI (P) Ltd.

**Internal Continuous Assessment** *(Maximum Marks: 50)*

50% - Tests *(minimum 2)*

30% - Assignments *(minimum 2)* such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:** *(Maximum Marks: 100)*

*Examination duration: 3 hours*    
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A** *(20 marks)* - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B** *(80 Marks)* - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

**Course outcome:**

After completion of this programme, students are expected to know

- Importance of various elements of marketing mix.
- Application of various techniques in design of optimum marketing mix.
- Planning marketing programs for better performance of the organisation.
13.805.3 DESIGN AND ANALYSIS OF ALGORITHMS (N) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- Understand the steps in algorithm analysis.
- Understand the limitations of Algorithm power.
- Learn different algorithm design techniques.

Module - I


Module - II


Module - III


Module - IV


References:


**Internal Continuous Assessment Pattern:** *(Maximum Marks: 50)*

- 50% - Tests *(minimum 2)*
- 30% - Assignments *(minimum 3)* such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- **Examination duration:** 3 hours
- **Maximum Total Marks:** 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each full question carries 20 marks.

**Course Outcomes:**

Upon completion of the subject, students will:

- Be able to design algorithms for various computing problems.
- Critically analyze the different algorithm design techniques for a given problem.
- Be able to modify existing algorithms to improve efficiency.
13.805.4 MANAGERIAL ECONOMICS (N) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- The course is aimed at building a perspective necessary for the application of modern economic concepts, precepts, tools and techniques in evaluating business decisions taken by a firm.
- The course will also look at recent developments in business in the context of economic theory.

Module – I
Demand analysis and theory of production: Demand function, Determinants of demand, Elasticity of demand, Applications of demand analysis in managerial decision making, Economic Forecasting: - Sources of data, Time series analysis – Trend projection, Exponential smoothing; Barometric forecasting, Input/output analysis.

Module – II
Demand analysis and theory of production: Demand function, Determinants of demand, Elasticity of demand, Applications of demand analysis in managerial decision making, Economic Forecasting: - Sources of data, Time series analysis – Trend projection, Exponential smoothing; Barometric forecasting, Input/output analysis.

Module – III
Production theory and analysis:- The Production function, Production with one variable input, Production with two variable inputs, Economies of scale and scope, Estimating the production function. Cost Theory and Analysis: Economic concept of cost, Production and cost, Short-Run and Long-run cost functions, Profit contribution analysis, operating leverage, Estimating cost functions. Market Structure:- Introduction to Market structure, Perfect competition, Monopoly, Monopolistic competition, Oligopoly, Barriers to entry, Application of Game theory to oligopoly.

Module – IV
of national income; Inflation: Meaning, theories and control measures, recent developments in Indian economy.

References:

Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

After the completion of this course, students will get necessary foundation on the following:
- Obtain an overview of modern economic concepts.
- Apply the tools and techniques in evaluating business decisions taken by a firm.
- To learn the recent developments in business.
13.805.5 MULTI-CRITERIA DECISION MAKING (N) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P) Credits: 4

Course Objective:

- To provide knowledge of the latest multi-criteria decision making techniques.
- To make the students aware of the application of these techniques in practical applications.
- To enable students to select appropriate multi-criteria decision making methods for specific applications.

Module – I

Multi-criteria decision making: Objectives. SMART - Categorization, Criterion weights and aggregation. Theory of vector optimization: Solution concepts, Vector variational inequalities and vector equilibria, Multi-criteria fractional programming, Multi-criteria control problems.

Module – II

Goal programming: Classification of GP, Integration and combination of GP with other techniques- applications. Evolutionary algorithms and multiple objective optimizations: Definitions, Pareto based and Non-Pareto based techniques- applications.

Module – III


Module – IV

Data Envelopment Analysis in multi criteria decision making: Basic DEA models, GDEA. Introduction to outranking methods: - ELECTRE and PROMETHEE I and II methods. Applications of MCDM methods: - MCDM in discrete and network location problems, MCDM in Portfolio decision making, MCDM in discrete financial decision making problems.

References:

1. Arakawa and Billaut, Multiple criteria Optimization, Kluwer.
2. Lootsma, Multi-Criteria Decision Analysis via Ratio and Difference Judgement, Springer.


**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests *(minimum 2)*
- 30% - Assignments *(minimum 2)* such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern: (Maximum Marks: 100)**

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

**Course outcome:**

After the completion of this course, the student

- shall be able to get an introduction to various multi-criteria decision making techniques, which is one of the fast growing subfields of Operations Research.
- is introduced to various tools for making choices in the presence of multiple conflicting criteria.
13.805.6 FACILITIES DESIGN AND PLANNING (N) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- Should develop knowledge on various facility planning and design methods.
- Should be in a position to use various qualitative as well as quantitative methods of facility planning and design in different industries.
- Should acquire knowledge on various material handling techniques and line balancing methods.

Module – I

Basic concepts, Evolution and motivation-Layout Design of factories and facilities - Selection of site and location decisions – Product, Process, combination, fixed and cellular layouts – Systematic layout planning – Graph based processes - Computer applications in layout designs construction and improvement algorithms in layout design.

Module – II

Quantitative Facility Planning Models- Facility Location Models-Rectilinear Facility Location Problem Design of Auxiliary Service Spaces - Receiving and Shipping, Storage, Aisles, Warehousing and Employee services. Office layout techniques and space requirements. Environmental aspects like lighting, Ventilation, dust control, humidity. Different type of Plant services like steam, compressed air etc.

Module – III

Material handling system and equipment –Principles, Material handling in Plants, Stores and warehouses, Receiving and dispatching area – Choice of material handling equipment – Cost control in material handling. Automatic Guided Vehicles- Basic concept, Design and operational control of an AGV system transportation control, operational control, Combinations.

Module – IV

Equipment replacement – Repair and replacement based on technical and economical consideration. - Design of Assembly lines, Line balancing methods. Advanced areas in facilities design and planning.
References:

5. Peymberton A. W., Plant layout and Material Handling.
7. Sharma S. C., Material Handling and Layout.

Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

- Thorough understanding of SLP method and Graph based method.
- Should be in a position to design proper material handling device for the designed layout.
- Acquire knowledge on Equipment Replacement and its importance in Facilities planning and Design.
13.806.1 FLEXIBLE MANUFACTURING SYSTEMS (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:
- Should develop knowledge on material handling.
- Should be able to use petrinet, DNC and PLC.
- Should acquire knowledge on scheduling, GT and JIT.

Module – I

Module – II

Module – III
Concepts of distributed numerical control: DNC system – communication between DNC computer & machine control unit – hierarchical processing of data in DNC system – features of DNC systems. Programmable controllers: Control system architecture – elements of programmable controllers: languages, control system flowchart, comparison of programming methods.

Module – IV
References:


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: *(Maximum Marks: 100)*

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

*Part A (20 marks)* - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

*Part B (80 Marks)* - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

*Note:* If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

After the completion of this course, students will get necessary foundation on the following:

- Understand various advanced material handling systems.
- Understand the use of different types of PLC and DNC.
- Acquire knowledge on scheduling, GT and JIT.
13.806.2 AGILE AND LEAN MANUFACTURING (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- Provide an understanding of the characteristics of internationally competitive manufacturing systems and knowledge of, and experience in using, the lean/ agile manufacturing philosophy and techniques.
- Practice in carrying out the redesign process and in using the appropriate methodologies/tools for the practical and detailed realization of the newly designed or redesigned lean/ agile manufacturing system.

Module – I


Module – II


Module – III

Manufacturing agile practices: Overview-establishing a manufacturing system design-embedding manufacturing system design in the shop floor- implementing visual methods of control-flow production- agility through group technology-agility through manufacturing cells-agility through setup and change over reduction-material management strategy for agility-make Vs buy strategy for agility- understanding the value of investing in people - agility Vs perfectionism.

Module – IV

Lean manufacturing: Introduction-definition and scope-continuous Vs lean production-benefits and methodology-process oriented continuous improvement teams-lean

References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours Maximum Total Marks: 100
The question paper shall consist of 2 parts.

Part A (20 marks) - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.
Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

After the completion of this course, students will get necessary foundation on the following:

- Know about modern trend of manufacturing
- Customization of product for the manufacturing
- Implementation of new technology
- Identify the waste and how to eliminate that waste
13.806.3 TOTAL QUALITY MANAGEMENT (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- Should develop knowledge on principles and practices of TQM to achieve quality.
- Should be able to use TQM tools for continuous quality improvement.
- Should acquire knowledge on implementation of quality standards.
- Should acquire advanced knowledge on latest TQM tools and techniques.

Module – I

History of quality, Major contributions of Deming, Juran and Crossby to quality Management, total quality, quality control tools, principles of Total Quality Management (TQM), Quality trilogy, models for TQM, core concepts, characteristics and subjects of TQM. Total Quality and Quality Management systems, quality principles, Total quality control, total waste elimination, total employee involvement.

Module – II


Module – III

Quality planning: SWOT analysis-Strategic planning-strategic grid-organizational culture Total Quality Culture, system approach to TQC, Quality function deployment, QFD concept, overview & QFD process, the voice of customer developing a QFD matrix, reviewing the matrix for priority items, organizing teams & planning QFD projects, Six sigma approach – application of six sigma approach to various industrial situations.

Module – IV

Process RE-engineering, BPR philosophy, possibilities & pitfalls, BPR framework, opportunity assessment, planning & BPR project, risk & impact assessment, planning & implementing the transition; Failure mode & effect analysis; FMEA: concepts & applications in TQM; Quality cost, concepts, quality cost definitions, quality cost program implementation, use of

References:


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

**University Examination Pattern: (Maximum Marks: 100)**

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

*Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.*

Course outcome:

- Understand the principles and practices of TQM.
- Understand the use of TQM tools for continuous quality improvement.
- Acquire knowledge on implementation of quality standards.
- Acquire advanced knowledge on latest TQM tools and techniques.
13.806.4 BUSINESS PROCESS REENGINEERING (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- Should develop knowledge on business process reengineering, its needs benefits and difference between other management techniques.
- Should understand relation between business process reengineering and information technology based new industrial engineering.
- Should acquire knowledge on advanced role of business process reengineering in enterprises resources planning implementation and future of business process reengineering

Module – I


Module – II


Module – III

Big Small-r reengineering - Role of BPR in ERP implementations-Business Process Visualization-simulation-prototyping-transition and change management for the new process implementation-Role of training in change-BPR is not downsizing-Business Process audit steps- Process innovation-Core process redesign-Organizational change ecology- Risks in BPR.
Module – IV

Future of BPR- Reengineering knowledge work-participative reengineering instead of top down approach-Rapid reengineering using tools that evolve-Reengineering for value and growth- BPR to BPM evolution-Phases in Business Process Management- Case studies.

References:

5. Sethi and King, Organizational Transformation through Reengineering, Pearson.

Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.
Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

- Knowledge on business process reengineering, its needs benefits and difference between other management techniques.
- Understanding on relation between business process reengineering and information technology based new industrial engineering.
- Knowledge on advanced role of business process reengineering in enterprises resources planning implementation and future of business process reengineering.
13.806.5 ECONOMETRICS (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) 
Credits: 4

Course Objective:

- To introduce the students to the importance and applications of econometric models.
- To introduce the students to linear and nonlinear regression analysis and their application to economics and business.
- To provide students hands on experience on econometric software in addition to theory classes.

Module – I

Introduction to Econometrics- History, Methodology and Types. Regression Analysis: Linear Regression Model, Assumptions of the Classical Linear Regression Model, Two-Variable Regression Analysis – Basic Ideas, Problem of Estimation, Classical Normal Linear Regression Model, Interval Estimation and Hypothesis Testing, Extensions; Multiple Regression Analysis; Dummy Variable Regression Models.

Module – II


Module – III


Module – IV


References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern: (Maximum Marks: 100)

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

Course outcome:

- The students will have the knowledge of econometric models.
- The students will show the ability to apply econometric analysis to analyze real world data and solve real world problems.
- The students will have the experience on the use of econometric software.
13.806.6 HUMAN FACTORS IN ENGINEERING (N) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- To provide a detailed understanding of human system, and its interaction with other systems and environment.
- To provide an adequate background for applying the concept of human factors in Engineering and Design fields.

Module – I

Introduction to human system: Definition, human technological system, multidisciplinary engineering approach, human machine system, manual, mechanical, automated system, human system reliability, conceptual design, advanced development, detailed design and development, human system modeling.

Module – II

Information input for human system: Input and processing, text, graphics, symbols, codes, visual display of dynamic information, auditory, tactual, olfactory displays, and speech communications. Human system output and control: Physical work, manual material handling, motor skill, human control of systems, controls and data entry devices, hand tools and devices.

Module – III

Human factors in workplace design: Applied anthropometry, workspace design and seating, arrangement of components within a physical space, interpersonal aspects of workplace design, design of repetitive task, design of manual handling task, work capacity, stress, fatigue.

Module – IV

Work place environment and work place design: Effects of factors such as illumination, climate, noise, motion, sound, vibration in design of workplaces. Applications of human factors in real and virtual environments: Human error, accidents, human factors and the automobile, organizational and social aspects, steps according to ISO/DIS6385, OSHA’s approach, virtual environments.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern: (Maximum Marks: 100)**

*Examination duration: 3 hours Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** If use of tables and charts are permitted for the university examination for this course, proper direction of the same should be provided on the facing sheet of the question paper.

**Course outcome:**

After the completion of this course, students will get necessary foundation on the following:

- The student will get a strong understanding of human system and its adaptability in the real working environments.
- The students will get an insight about the functioning and capability of human system in real world.
13.807 SEMINAR (MNPSU)

Teaching Scheme: 0(L) - 0(T) - 2(P)  

Credits: 2

Course Objective:

*The main objective of this course is to provide experience in presentations and to improve their communication skills.*

The student shall present a seminar on a topic which is of high relevance to Industrial Engineering. A seminar report must be submitted at the end of the semester. The topic of the seminar shall be different from the topic of his/her project work which is being done during seventh and eighth semesters.

Internal Continuous Assessment *(Maximum Marks-100)*

- 40% - Assessment by the Guide
- 40% - Assessment by the Committee.
- 20% - Regularity in the class

Course Outcome:

*After completion of this course the students will be able to*

- Acquire the basic skills to perform literature survey and present papers
- Acquire communication skills
13.808 PROJECT, VIVA-VOCE AND INDUSTRIAL VISIT (MNPSU)

Teaching Scheme: 0(L) - 0(T) - 5(P)  
Credits: 5

Course Objective:

- To do a detailed study on a selected topic based on current journals or published papers.
- To impart the ability to perform as an individual as well as a team member in completing a project work.

The project work (project phase 1) started in the seventh semester, shall be continued (project phase 2) in the eight semester. The student/s must submit the final project report at the end of the eight semester. At least two evaluations should be conducted by a panel consisting of project coordinator/senior faculty, project guide, and a faculty specialized in the area. The students may be assessed individually and in groups.

Internal Continuous Assessment (Maximum Marks-100)

The distribution of marks is as follows:

Work Assessed by Guide: 50%
Assessed by a three member committee: 50%

University Examination Pattern:

Viva-Voce  
Maximum Total Marks: 100

Marks shall be awarded based on the overall performance, Project report, Seminar report, Subject knowledge and general awareness in the field of Industrial Engineering

Course Outcome:

After completion of this course the students will be able to

- Acquire the basic skills to perform literature survey and present papers
- Acquire communication skills and improve their leadership quality as well as the ability to work in groups.