## Scheme of M. Tech in CAD/CAM

### SEMESTER-I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC701</td>
<td>Computer Aided Design</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>MEC702</td>
<td>Advanced Mechatronics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td>MEC703</td>
<td>Computer Integrated Manufacturing System</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC704</td>
<td>Rapid Prototyping</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>5.</td>
<td>MEC705</td>
<td>Robotics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>6.</td>
<td>MEC706</td>
<td>Computer Aided Design Lab</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>20</td>
<td>0</td>
<td>4</td>
<td>22.0</td>
</tr>
</tbody>
</table>

### SEMESTER-II

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC711</td>
<td>Computer Control of Machine Tools</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>MEC712</td>
<td>Finite Element Methods in Engineering</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Elective -I</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC713</td>
<td>Machine Tool Design</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>5.</td>
<td>MEC714</td>
<td>Design Analysis Lab</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>6.</td>
<td>MEC715</td>
<td>Research Methodology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>20</td>
<td>0</td>
<td>4</td>
<td>22.0</td>
</tr>
</tbody>
</table>

### SEMESTER-III

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Elective -II</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Elective -III</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td>MEC795</td>
<td>Dissertation Phase-I</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC730</td>
<td>CNC Lab</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>8</td>
<td>0</td>
<td>16</td>
<td>16.0</td>
</tr>
</tbody>
</table>

### SEMESTER-IV

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC796</td>
<td>Dissertation Phase-II</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12.0</td>
</tr>
</tbody>
</table>
### Elective I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC721</td>
<td>Industrial Automation</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>MEC722</td>
<td>Computational Fluid Dynamics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td>MEC731</td>
<td>Programming in Mat Lab</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC752</td>
<td>Advanced Manufacturing Processes</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>5.</td>
<td>MEC755</td>
<td>Product Design and development</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

### Elective II

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC723</td>
<td>Computer aided Production Planning</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>MEC725</td>
<td>Non Destructive Testing</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td>MEC726</td>
<td>Advanced Tool Design</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC790</td>
<td>Instrumentation and Control</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

### Elective III

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MEC727</td>
<td>Design of Hydraulic and Pneumatic Systems</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>MEC728</td>
<td>Micro Electro Mechanical Systems</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>3.</td>
<td>MEC729</td>
<td>Quality and Reliability Engineering</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>4.</td>
<td>MEC788</td>
<td>Optimization Techniques</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.0</td>
</tr>
</tbody>
</table>
Course Title : Computer Aided Design
Paper Code : MEC 701

Objective:

- To impart knowledge about the applications and benefits of CAD.
- To impart knowledge about mathematical basics for geometric modelling of curves, surfaces, solid models and geometric transformations.

UNIT-A


UNIT –B


UNIT –C


UNIT –D

Geometric Transformations and CAD/CAM Data Exchange: Need for geometric transformations, Two Dimensional and Three dimensional geometric transformations including Translation, Rotation, Scaling, overall scaling, Reflection, orthographic and perspective projections, Homogeneous Transformations, Concatenated transformations, CAD/ CAM data exchange formats, evolution of exchange formats including shape based, product based formats, Graphics and computing standards– Open GL Data Exchange standards – IGES, PDES etc.
References:

Course Title: Advanced Mechatronics
Paper Code: MEC 702

Objective:
- To introduce the students with the sensor technology, signal conditioning, digital electronics and control systems.
- To learn how to apply the Principles of Mechatronics and Automation for the development of productive and efficient manufacturing systems.
- To study the hydraulic and pneumatic systems employed in manufacturing industry.
- To learn the CNC technology and industrial robotics as applications of Mechatronics in manufacturing automation.

UNIT A


UNIT B


UNIT C

UNIT - D


References:
Course Title: Computer Integrated Manufacturing System
Paper Code: MEC 703

Objective: In this course, the student will:

- Obtain an overview of Computer Technologies including Computers, Database and Data Collection, Networks, Machine Control etc, as they apply to Factory Management and Factory Floor Operations.
- Describe the Integration of Manufacturing Activities into a Complete System.
- Acquire sensitivity to Human-Factors related issues as they affect decision making in the Factory Environment.

UNIT -A


UNIT –B


UNIT –C


UNIT –D

Manufacturing database and communication: Data-Manufacturing, Data Types, Sources, Structure of Data Models, Data Base and DBMS- Requirement, RDBMS, Shop Floor Control, Data Logging and Acquisition, Automated Data Collection, Control Types, Fundamentals of Communication, Communication Matrix, Network Architecture.
References:


Objective:
- To Provide the Students with an Understanding of the Basic Fundamentals of Rapid Prototyping, its Fabrication Techniques, Materials and Various areas of Defects and Improvements in Rapid Prototyping.

UNIT-A


UNIT-B


UNIT-C


UNIT-D

Reverse Engineering: Introduction to Reverse Engineering and its Integration with Rapid Prototyping. Business Opportunities and Future Directions: Introduction, New type of Products and Employment, Digiproneurship. Research Assignment: The students will be given different Assignments to write their codes in MATLAB for constant slicing, Adaptive Slicing, Transformations, Parametric Curves and Surfaces Involved in Rapid Prototyping.
References:

Course Title: Robotics  
Paper Code: MEC 705

Objectives:

- To impart exposure to basic Robot Configurations, Sensors, Actuators.
- To impart knowledge about Kinematics/ Dynamics, Control and Programming of Robots.

UNIT -A


UNIT -B


UNIT -C


UNIT -D

**Programming and Applications**: Methods of Robot Programming, Lead through Programming, Motion Interpolation, Use of Branching, Textual Robot Languages, Structure, Motion Commands, Speed Control, End Effectors and Sensor Commands, Application of Robots in Industrial Environments such as in Assembly, Welding, Spray Painting, Machine Loading and Unloading etc.
References:

Course Title: Computer Aided Design Lab
Paper Code: MEC 706

Objectives: To impart knowledge on how to prepare Drawings for various Mechanical Components using any commercially available 3D Modelling software.

List of Experiments:

1. Introduction to Creo.
2. Introduction to various commands in Sketcher mode and exercises.
3. Introduction to Feature manipulation- Copy, Edit, Pattern, Suppress, History operations, Constraints etc.
4. Introduction to various commands in Part Mode and exercises.
5. Introduction to various commands in advance Part Mode and exercises.
6. Introduction to various commands in Surface Modelling and exercises.
7. Introduction to various commands in Assembly.

Student is expected to do a project work related to modelling of a mechanical component assembly at the end of the semester.
Course Title: Computer Control of Machine Tools
Paper Code: MEC 711

Objective: The aim of this course is to

- Teach the applications of various Computer Numerical Control Machines.
- Design and Operational Characteristics of Key Hardware Components and Programming Techniques.
- Merits and Demerits of Computer Numerical Controlled (CNC) Machines.

UNIT -A


UNIT –B


UNIT –C

CNC , DNC and Adaptive Control systems: Types and functions of Computer Numeric Control (CNC), Types and functions of Direct Numeric Control (DNC), Need of Adaptive Control Types, Functions and Types of Adaptive Control-its uses & benefits, Advantages of Combined CNC/DNC Systems. Control systems for Positional Control and Tool Changing Systems, Digital Computer and its Functioning for m/c control, Microprocessor in CNC.

UNIT –D

References:

Course Title: Finite Element Methods in Engineering
Paper Code: MEC 712

Objective: Students will learn about
- Basic concepts of FEM,
- One and Two Dimensional Problems in FEM
- Problems of Static, Scalar Field and Dynamics

UNIT-A


UNIT-B

One and Two Dimensional Problems: Introduction, Coordinates and Shape Functions, Potential Energy Approach, Galerkin Approach, Assembly of the global Stiffness Matrix and Load Vector, FEM equations and treatment of Boundary Conditions, Quadratic Shape Functions, Finite Element Modeling, Constant Strain Triangle (CST), Problem Modeling and Boundary Conditions.


UNIT-C

Truss, Beams and Frames: Plain and Three Dimensional Trusses, Beams on Elastic Support, Plain and Three Dimensional Frames, Beams and Frames in various Boundary Conditions.


UNIT-D


References:


3) Bathe, J.K. *Finite Element Procedures in Engineering Analysis*. Prentice Hall 2007 Print

Objective: Students will learn about

- Machine tool elements and its design, its construction features
- Drives, controls and vibrations in the structure of machine tool.

UNIT -A


UNIT -B


UNIT -C


UNIT -D


References:

List of Experiments:

A. **Modeling of stress analysis using Nastran software for:**
   1. Bars of Constant Cross Section Area and Tapered Cross Section Area.
   2. Two Bar and Four Bar Trusses.
   3. Beams – Simply supported, Cantilever and Beams with UDL.
   4. Two dimensional rectangular plate with a circular Hole.
   5. Find the Deformation and Stress Distribution in the wall of the Open Ended Cylinder using Axisymmetric Element.
   6. A Three Dimensional body is fixed at one End and Loaded at the other. Find the deflection at the Load and Maximum Principal Stresses.

B. **Modeling of thermal analysis using Nastran software for:**
   1. 1D, 2D and 3D problem with conduction and convection boundary conditions.

C. **Modeling of dynamic analysis using Nastran software for:**
   1. Determine the frequency response of the 2D rectangular plate.
   2. Determine the transient frequency response of the 2D rectangular plate.
Objective: The course is designed to introduce the students to research methodology and application of research techniques and procedures. The primary goal of this course is to develop a sound understanding of research methods.

Learning Outcomes: The students will be able to apply the various research methods to solve the real life problems.

UNIT – A

Introduction to Research: Objectives and Types of Research, Research Approaches, Significance and process, Criteria of Good Research, Selecting the Problem, Necessity of Defining the Problem and Technique Involved in Defining a Problem.


UNIT – B


UNIT – C

Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.

Processing and Analysis of Data: Measures of Central Tendency, Dispersion, Asymmetry (Skewness), Measures of Relationship Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, Association in Case of Attributes, Other Measures.


UNIT – D


**Design of Experiments and Analysis of Variance and Covariance:** Taguchi and RSM, Analysis of Variance (ANOVA), The Basic Principle of ANOVA, ANOVA Technique, Setting up Analysis of Variance Table, Short-cut Method for One-way ANOVA, Coding Method, Two-way ANOVA, ANOVA in Latin-Square Design, Analysis of Co-variance (ANOCOVA), ANOCOVA Technique, Assumptions in ANOCOVA.

**References:**

**Course Title:** CNC Lab  
**Paper Code:** MEC 711

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**List of Experiments:**

1. To learn and study of working Principle and Parts of CNC Lathe.
2. To Generate the N.C code of the Drawing consisting turning and Facing Operations To Generate the N.C code of the Drawing consisting Taper Turning, Grooving, Drilling and Threading Operations.
3. To Study the different types of Tooling used and Re-Circulating Ball Screw used in Lathe Machine.
4. To study the N.C coordinate system of different N.C system.
5. To study the working principle and parts of CNC Milling Machine.
6. To Generate the N.C code of the Drawing Consisting Contour Milling Operations.
7. To study the different Sensors and Stepper Motors used in CNC Machines.
8. To study the Open and Closed Loop Systems.
Objective:
After successful completion of the course, student will be able to
- To identify potential areas for automation and justify need for automation
- To select suitable major control components required to automate a process or an activity
- To translate and simulate a real time activity using modern tools and discuss the benefits of automation.
- To identify suitable automation hardware for the given application.
- To recommend appropriate modeling and simulation tool for the given manufacturing application.

UNIT-A


Artificial Intelligence and expert system: Intelligence, Artificial Intelligence, Background, Definition and its Application in Manufacturing, Expert system and its Industrial Application. A.I. Programming for expert systems.

UNIT –B


UNIT –C


Distributed Control System: Functional Requirements, Configurations & some Popular Distributed Control Systems.
UNIT –D


References:

Course Title: Product Design and Development  
Paper Code: MEC755  

Objective:  
- To introduce the Objectives of product design and the Requirements of a Good Product Design.  
- To expose the students to different Design Principles like Designing for function, Production, Installation and Handling, Maintenance, Packaging etc.

UNIT - A  
The Process of Product Design: Design by evolution, Limitations of evolutionary method in modern design situation, Structure of design process, Morphology of design, Specifications and Standards of performance, Environmental factors, Creativity techniques in design problem.

UNIT - B  

UNIT - C  

UNIT - D  

References:  
Course Title: Advance Manufacturing Processes

Paper Code: MEC752

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Objective: Students will learn about
- Non-Conventional Machining Processes, its Construction features, Comparison of its Aspects.
- Principles, Analysis, Control Parameters and its effect on the response Parameters.

UNIT-A

Introduction: Need of Non- Conventional Machining Processes, Classification of Modern Machining Processes, Process Selection, The Benefits and Limitations over Conventional Machining Processes.


UNIT –B

Electro Chemical and chemical based processes: Working principles, elements of the process, process parameters, analysis of machining, response characteristics, Applications of the electro chemical and chemical processes. Electro chemical grinding, Electrochemical deburring, Electrochemical honing.

UNIT –C

Electrical energy based processes: Working principles, Elements of the process, Process parameters, Analysis of machining, Response characteristics, Applications of the Electro-Discharge Machining, Laser Beam Machining, Plasma Arc Machining.

UNIT –D


References:

Course Title: Programming in Matlab
Paper Code: MEC 731

Objective:
- The main objective of this course is to provide the students with the opportunity to improve their Programming Skills using the MATLAB environment to implement algorithms and to teach the use of MATLAB as a tool in solving problems in engineering.
- Upon completion of this course, the students can able to use the MATLAB applications in engineering problem solving.

UNIT-A


UNIT -B


UNIT -C

UNIT –D


**References:**

Course Title: Computational Fluid Dynamics
Paper Code: MEC 722

Objective: This course aims to
- It will enable the students to understand the various Discretization Methods and solving Methodologies and to create confidence to solve complex problems in the field of Heat Transfer and Fluid Dynamics.

UNIT-A


UNIT -B

Finite volume methods: Different types of finite volume Grids; Approximation of surface and volume integrals; Interpolation methods; Central, upwind and hybrid formulations and comparison for convection-diffusion problem. Finite Element Methods: Finite element methods; Rayleigh-Ritz, Galerkin and Least square methods; Interpolation Functions.

UNIT -C


UNIT -D

References:
Course Title: Computer Aided Production Planning
Paper Code: MEC 723

Objective: The aim of this course is to provide the student with an understanding of the importance of process planning role in manufacturing and the application of Computer Aided Process Planning tool in the present manufacturing scenario.

UNIT -A

Process Planning: Traditional process planning, process planning elements, product design evaluation; Selection of tooling and process parameters; Operation sequence evaluation.

Computer Aided Forecasting: Nature and use of forecast, Sources of data, Demand Patterns, Forecasting Models, Selection of Forecasting Technique, Measurement of forecast Accuracy, Computerized Relative Allocation of Facility Technique, Automated Layout design program and Computerized Relationship layout planning for facility location and layout.

UNIT –B


UNIT –C

Production Systems at Operation Level: Manufacturing support systems and concepts at the level of production processes; Computer generated time standards; Machinability data system; Cutting condition optimization.

Production Systems at Plant Level: Communication oriented production information and control system (COPICS); material requirements planning_ capacity planning; shop floor control and operation scheduling.

UNIT –D

MRP: Introduction, Objective, Input, Computational procedure, Information provided by the system. Detailed capacity planning. Manufacturing resources planning

ERP: Introduction, main features, generic model of ERP system, selection of ERP, proof of concept approach, analytic hierarchy approach, ERP implementation.

References:


8. Group Technology; *Prod. Method in Manufacturing* Gallagher & Knight Ellis Hosewood.


Course Title: Instrumentation and Control Engineering
Paper Code: MEC 790

Course Objectives: Students will learn about; the basic concepts of control engineering, instrumentation control system, Sensors signal transmission, Transfer functions of mechanical, electrical, pneumatic and hydraulic systems.

UNIT-A

Introduction: Review of basic principles of measurement & process control systems; Elements of instrumentations.
Instrumentation system elements: Introduction, displacement sensors, speed sensors, fluid pressure sensors, fluid flow, liquid level, temperature sensors, sensor selection, signal transmission.

UNIT-B

Measurement: Principles of Dynamic Measurement; Transducers, Amplifiers and Recording systems; Measurement of Physical Variables, i.e. Motion, Strain, Force, Torque, Temperature, Pressure and Flow etc. Principles of optical, Eddy Current based and Ultrasonic based Measurement Devices for Metrological Applications; Interferometers; Principles of Holography; Calibration its importance and General principles.

UNIT-C

Control systems: Concepts, Controller characteristics, Transfer functions of Mechanical, Electrical, Pneumatic and Hydraulic Systems; Transients and frequency response; Types of control action. Cascade control, Feed Forward Control, Digital Control System, Control Networks.

UNIT-D

Stability: Concept, criterion and determination by analytical and graphical methods Routh, Hurwitz, Bode and Niquist, Relative stability.

References:
Course Title: Non Destructive Testing
Paper Code: MEC 725

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

**Objective:** To study and understand the various Non-Destructive Evaluation and Testing Methods, Theory and their Industrial Applications. Upon completion of this course, the students can able to use the various Non-Destructive Testing and Testing methods understand for Defects and Characterization of Industrial Component.

**UNIT-A**

**Introduction:** Non-destructive versus destructive testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, various physical characteristics of materials and their applications in NDT.

**Visual Inspection:** Introduction, basic terms associated with visual inspection, equipment and accessories used for visual inspection, Visual Detection of Discontinuities, Evaluation of test results, application, advantage and limitations.

**UNIT –B**

**Liquid Penetration Testing:** Introduction, principle, Equipment, Characteristics of Penetrates and their types, Developer, Hazards Precautions, Evaluation of Test Results, Application, Advantage and Limitations.


**UNIT –C**

**Magnetic Particle Testing:** Principle of magnetic particle testing, Basic terms associated with magnetic particle testing, Different methods to generate fields, Magnetic particle testing equipment, Magnetic particle testing procedures, Method of de-magnetization, Magnetic particle medium, Evaluation of indication, Application, Advantage and Limitations.

**Ultrasonic Testing:** Introduction, Principle of operation, Basic terms associated with Ultrasonic Testing, Type of Ultrasonic Propagation and Probes, Type of Transducers, Data Representation, A-Scan, B-scan, C-scan, and Method for Evaluating Discontinuities, Ultrasonic Testing Procedures for different component, Application, Advantage and Limitations.

**UNIT –D**

**Eddy Current Testing:** Introduction, Principle of operation, Basic terms associated with eddy current testing, Factor effecting eddy current-defect-frequency-geometry-conductivity-Proximity (Lift off & Fill Factor), eddy current flow characteristics, Test
Equipment, Types of probes, Eddy current application and signal display, Advantage and Limitations.

References:
Course Title: Advance Tool Design
Paper Code: MEC 726

Objective: After successful completion of the course, student will be able to

- To explore various design aspects of machine tools elements like Transmissions, Structures, Materials, Kinematics, Dynamics and Construction of Machine Tools etc.
- To understand concepts related to Design of Die and Punch.

UNIT-A

Introduction: Tool design practice, procedure of tool design, process planning and tool design.

Mechanics of Machining: Place of machine in production, Classification of material removal processes, Orthogonal and Oblique Cutting, Merchant’s circle diagram-force and velocity relationship, Types of cutting tool mechanics, their characteristics and selection criteria, Mechanics of metal cutting- effect of tool-geometry and other cutting parameters, Mechanisms of formation of chips-types of chips formed, Concept of specific cutting pressure, Types of tool wear, Factors causing wear, Tool life, Variables affecting tool life, Economical cutting speed, Mach inability of metals, Economics of Machining.

UNIT-B

Thermal Aspects in Machining: Sources of heat generation in machining and its effects, temperature measurement techniques in machining, types of cutting fluids, Functions of cutting fluid, Characteristics of cutting fluid, Application of cutting fluids.

Design of Single Point Cutting Tools: Tool geometry for single point cutting tool, tool signature, Design of single point cutting tools such as solid tools, tipped tools, coated tipped tools, throw away type tools and diamond tools.


UNIT-C

Cutting Tool Materials: Types of cutting tool materials, their selection and applications.

Design of Press Tools: Introduction to press tools and related terminology, Effect of clearances, Theory of deformation, Stages of cutting operation, Centre of pressure, Strap strip layout, Die and Punch design, Design of simple, Compound and progressive dies, methods of mounting punches and dies, design of drawing dies, Bend allowances, Bending and forming dies, Dies for die-casting and forging operations.
UNIT –D

**Jigs and Fixture:** Essential requirements of jigs & fixtures, Economics of Jigs and Fixtures, Principles of location and clamping, Location and Clamping devices, Types of Drill Bushes, Types of Jigs and Fixtures, Standardization in Jigs and Fixtures, Principle of work holders and its types.

**Gauges and Gauge Design:** Introduction, Plain gauges, Design of limit gauges, Manufacturing of limits gauges, Choice of limits gauges, Thread or screw gauges, Advantages and limitation of limit gauges, Care of gauges, other types of gauges.

**References:**

Course Title: Design of Hydraulic and Pneumatic Systems.  
Paper Code: MEC 727

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Objective:
- To impart students on the science, use and application of Hydraulics and Pneumatics as Fluid Power in Industry.
- To impart knowledge on the methodology of basic and advanced design of Pneumatics and Hydraulics Systems.
- It helps students to get knowledge on the need, use and application of Fluid Power and make them familiar to industrial design that lead to automation.

UNIT-A


UNIT –B


UNIT –C

**Hydraulic and Pneumatic Design:** Electrical controls for fluid power Circuits, Design of Hydraulic & Pneumatic circuit for specific application - Cascading - Ladder diagram (Electrical controls), Microprocessor controlled design of Circuits, Circuits for Copying Lathe, Broaching Machines & Milling Machines. **Fluid Logic Controls Systems:** Principles of Fluid Logic Control, Basic Fluidic Devices Fluidic Sensors, Fluidic Logic Circuits.

UNIT –D

**Pneumatic Systems:** Pneumatic, Fundamentals, Merits & Demerits over Hydraulic systems, Pneumatic Conditioners - Filters - Regulators - Lubricators - Mufflers - Air dryers, Types of Air Compressors, Pneumatic Actuators, Design of Pneumatic Circuits.
**Fluid Circuit Failures:** Common causes of failure dirt - Heat - Misapplication - Improper fluids – Faulty Installation - Improperly designed Circuits.

**Maintenance:** Maintenance of Hydraulic & Pneumatic Circuits.

**References:**

Objective: The aim of this course is to teach the fundamentals of modelling and analysis of MEMS with a specialized focus on Electro- Mechanical actuated systems.

UNIT-A


UNIT –B

Micro Mechanics and Structures: Basic Mechanic, Axial Stress and Strain, Shear Stress, Poisson’s ratio, Commonly used Deflection Equations, Beam and Torsion Equations etc.
Mechanical Transduction Techniques: Piezo resistivity, Piezoelectricity, Capacitive Techniques, Optical Techniques, Resonant Techniques. Actuation Techniques, Smart Sensors. MEMS Simulation and Design tools Behavioural modeling simulation tools and Finite element simulation tools.

UNIT –C


UNIT –D

MICROFLIDICS: Fluid Dynamics at Micro Scale, Surface Tension Driven Transport, Micro Pumps, Valves and Mixers, Lab on chip applications.
References:

Objective: After successful completion of the course, student will be able to
- understand importance of optimization of industrial process management
- apply basic concepts of mathematics to formulate an optimization problem
- analyses and appreciate variety of performance measures for various optimization problems

UNIT-A

Introduction to optimization techniques: Operation Research approach, scientific methods, introduction to models and modelling techniques, methodology and advantages of optimization techniques.


Sequencing: Introduction, Processing N jobs through two Machines, Processing N jobs through three Machines, Processing N jobs through m Machines.

UNIT –B

Inventory Model: Introduction to inventory control, Deterministic Inventory Model, EOQ model with Quantity Discount.

Network Analysis: Network definition and Network Diagram, Probability in PERT Analysis, Project time cost trade off, Introduction to resource smoothing and allocation.

UNIT –C


Replacement & Maintenance Models: Replacement of items, Subject to deterioration of items subject to random failure group vs. individual replacement policies.


UNIT –D

Simulation: Introduction & steps of simulation method, Distribution Functions and random number generation.

Introduction to various evolutionary optimization techniques: i.e. Generic algorithm, NSGA, NSGA-II, Neural Network, Ant colony optimization, Particle swarm optimization etc.
References:
Course Title: Quality Control and Reliability  
Course Code: MEC 729

Course Objectives:

- To impart the knowledge about concepts of quality control.
- To make students learn various control charts used for quality control.
- To learn the concepts of acceptance sampling.
- To learn about reliability and its testing.

UNIT – A

Introduction: Concept of quality, Need, Factor influencing quality, Types of quality, Quality control, Cost of quality control, Quality assurance, Benefits, Modern concept, Inspection and quality control, Quality characteristics, Quality circles with case study, Quality function deployment, Benchmarking and performance evaluation, Tools for continuous quality improvement, Philosophies of quality gurus and their impact on quality.

UNIT – B


Introduction to acceptance sampling, Advantages and Disadvantages, Operating Characteristics curve and its characteristics, Producer’s and consumer’s risk, Quality indices for acceptance sampling plans, Types of sampling Plans-single double sequential sampling plan, Sampling plan for variables, continuous sampling plans, Skip lot sampling plans, Chain sampling plan. Average outgoing quality.

UNIT – C

Reliability: Introduction, Factors effecting Reliability, Failure and its types, Failure curve, reliability and its management, MTBF, MTTF, Relationship b/w reliability failure rate and MTBF, and its characteristics, reliability predictions and analysis, Life-cycle curve and Probability distributions in Modeling reliability.

UNIT – D

Reliability Testing: System reliability analysis considering systems in series, parallel and stand by configurations, Product testing, Reliability life testing, Test time calculations, Burn-in testing, Acceptance testing, Accelerated life testing, Experimental Design, Reliability growth testing.
References:


Course Title: Dissertation Phase-I  
Course Code: MEC 795

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

As per policy document of DAV University wide reference no. **DAVU/ Regr/2016/2613**
Course Title: Dissertation Phase-II
Course Code: MEC 796

As per policy document of DAV University wide reference no. DAVU/ Regr/2016/2613