| S.No. | Topic | No of Practicals |
|---|---|---|
| 5. | Writing programme for event advance mechanism of single server queuing system. | 1 |
| 6. | Writing programme for arrival module of single server queuing system. | 1 |
| 7. | Writing programme for departure module of single server queuing system and statistical performance. | 1 |
| 8. | Writing programme for solution of roots of equation. | 1 |
| 9. | Solving simple engineering problems using roots of equation. | 1 |
| 10. | Development of algorithm for Gaussian elimination. | 1 |
| 11. | Application of Gaussian elimination to mass balance problems and statically determinate truss. | 1 |
| 12. | Application of Gaussian elimination to analysis of electrical circuits. | 1 |
| 13. | Development of algorithm for Golden Sections and application. | 1 |
| 14. | Application of optimization technique to design of tank. | 1 |
| 15. | Application of optimization technique to waste water treatment. | 1 |
| 16. | Predator prey models and chaos. | 1 |
| | **Total** | **16** |

## X. Suggested Reading


- Balagurusamy E. 2000. *Numerical Methods.*Tata McGraw Hill Publishing Company limited, New Delhi.
- Chapra SC and Canale RP. 1994. *Introduction to Computing for Engineers*. 2nd Edition McGraw Hill International Edition, New York.
- Dent JB and Blackie MJ. 1979. *System Simulation in Agriculture.* Applied Science Publishers Ltd., London.
- Law AM. 2015. *Simulation Modeling and Analysis.* McGraw Hill International Edition, New York.
- Schilling RJ and Harries SL. 2002. *Applied Numerical Methods for Engineers Using MATLAB and C.*Thomson Asia Pvt. Ltd. Singapore.
- Veerarajan T and Ramachnadran T. 2004. *Numerical Methods with Programmes in C and C++.* Tata McGraw Hill Publishing company limited, New Delhi.


**I. Course Title : Computer Aided Design of Machinery**

**II. Course Code : FMPE 515**

**III. Credit Hours : 0+2**

## IV. Aim of the course

To learn the practice of designing components and assemblies based on computer aided drafting technique.

## V. Practical

Learning 2D drafting: Controlling display settings, setting up units, drawing limits and dimension styles. Drawing and dimensioning simple 2D drawings, keyboard shortcuts. Working with blocks, block commands. Exercise in simple assembly in orthographic. Exercise in measuring and drawing simple farm machinery parts. Learning 3D Drafting: Advantages of virtual prototyping-starting the 3D drafting environment, self learning tools, help and tutorials. Familiarizing with user interface, creating files and file organization, structuring and streamlining. Features of document window. Concept of coordinate system: Working coordinate system, model coordinate system, screen coordinate system, graphics exchange standards and

database management system. Working with feature manager and customizing the environment. Planning and capturing design intent. Documentation of design. Using design journal and design binder. Preliminary design review and layout.

Practice in drawing 2D sketches with sketcher and modifying sketch entries. Adding Reference geometry: Planes and axes. Adding relations and working with relations. Dimensioning a sketch. Exercises.

Parts and features: Sketched features and applied features, pattern and mirror features. Documenting design. Assembly: Creating and organizing assemblies, connecting parts and subassemblies with mates. Organizing the assembly by using layouts.

Exercise in creating drawing: Setting up and working with drawing formats, creating drawing views from the 3D model, making changes and modifying dimensions.

Case studies: Measuring and drawing assemblies of farm implements and their components.

**VI. Learning outcome**

The student will be able to conceptualize spatial concepts and design components and assemblies of Farm machinery and make graphic models using commercial CAD software like Solid Works, Catia and AutoCAD.

**VII. List of Practicals**

| S.No. | Topic | No of Practicals |
|---|---|---|
| 1. | Learning 2D drafting: Controlling display settings, setting up units, drawing limits and dimension styles. | 2 |
| 2. | Drawing and dimensioning simple 2D drawings, keyboard shortcuts. | 1 |
| 3. | Working with blocks, block commands. Exercise in simple assembly in orthographic. | 1 |
| 4. | Exercise in measuring and drawing simple farm machinery parts. | 2 |
| 5. | Learning 3D Drafting: Advantages of virtual prototyping-starting the 3D drafting environment, self learning tools, help and tutorials. Familiarizing with user interface, creating files and file organization, structuring and streamlining. Features of document window. | 2 |
| 6. | Concept of coordinate system: Working coordinate system, model coordinate system, screen coordinate system, graphics exchange standards and database management system. | 2 |
| 7. | Working with feature manager and customizing the environment. Planning and capturing design intent. | 2 |
| 8. | Documentation of design. Using design journal and design binder. Preliminary design review and layout. | 1 |
| 9. | Practice in drawing 2D sketches with sketcher and modifying sketch entries. | 2 |
| 10. | Adding Reference geometry: Planes and axes. Adding relations and working with relations. Dimensioning a sketch. Exercises. | 2 |
| 11. | Parts and features: Sketched features and applied features, pattern and mirror features. Documenting design. | 2 |
| 12. | Assembly: Creating and organizing assemblies, connecting parts and subassemblies with mates. | 2 |
| 13. | Organizing the assembly by using layouts. | 1 |
| 14. | Exercise in creating drawing: Setting up and working with drawing formats, creating drawing views from the 3D model, making changes and modifying dimensions. | 2 |
| 15. | Case studies: Measuring and drawing assemblies of farm implements and their components. | 5 |
| | **Total** | **32** |

## VIII. Suggested Reading


- Jankowski G and Doyle R. 2007. *SolidWorks® For Dummies®*, 2nd Edition, Published by Wiley Publishing, Inc. ISBN: 978-0-470-12978-4
- Shih R H. 2014. *AutoCAD 2014 Tutorial-First Level: 2D Fundamentals*. SDC Publications


**I. Course Title : Advanced Manufacturing Technologies**

**II. Course Code : FMPE 516**

**III. Credit Hours : 2+1**

**IV. Aim of the course**

To learn the modern manufacturing techniques and their application to manufacture of different components and assemblies.

**V. Theory**

**Unit I**

Material and their characteristics, structure and properties of materials, wood, ferrous, Non-ferrous, alloys, plastic, elastomers, ceramics and composites. Material selection and metallurgy: Equilibrium diagram, time temperature transformation curves, heat treatments, surface treatment: Roughness and finishing.

**Unit II**

Measurement and quality assurance: Quality control, tolerance, limits and clearance. Automated 3-D coordinate measurements. Advance casting processes and powder metallurgy. Forming process: Fundamentals of metal forming, hot and cold rolling, forging processes, extrusion and drawing.

**Unit III**

Workshop practices applied in prototype production, jigs and fixtures. Traditional machining processes: Cutting tools, turning, boring, drilling, milling and related processes. Non traditional machining processes fuzzy c-mean (FCM), electric discharge machining (EDM), laser beam machining (LBM), Abrasive jet machining (AJM), and Wire-electro-discharge machining (EDM).

**Unit IV**

Joining processes: Gas flame processes, arc processes, brazing and soldering, adhesive and bonding.

**Unit V**

Numerical control: Command system codes, programme, cutter position X and Y, incremental movements, linear contouring, Z movements and commands. Manufacturing systems and automation. Robotics and robot arms. 3-D printing. Integrated manufacturing production system.

**Practical**

Identification of material and their application. Study of heat treatment processes and their suitability with respect to materials. Tool and equipments for measurements: Tolerance limits, clearance and surface finish. Site visits for study of advanced manufacturing techniques. Case studies.

**VI. Learning outcome**

The students will be able to select suitable manufacturing technique to fabricate different components used in Farm machinery.