



**SECOND SEMESTER 2021-2022**

Course Handout Part II

Date: 15-01-2022

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : ME F318 (L-T-P-U: 2-1-1-3)

**Course Title** : Computer Aided Design

**Instructor-in-Charge** : Prof. Srinivasa Prakash Regalla

**Tutorial/Practical Instructors** : Gaurav Sharma, P. Suswanth, V. Vamshi, G. Deepak Kumar

**Scope and Objective of the Course:**

Mathematical modeling of parametric curves, surfaces and solids. Geometric transformations, isometric transformations including translation, scaling, reflection, and rotation using specialized solid modeling packages. CAD/CAM data exchange. Introduction to FEM & FEA practice on a specialized CAE package. Modeling and simulation based practical exercises related to geometric modeling, finite element analysis, and machine drawing such as orthographic drawing, sectional view, assembly drawing & exploded view.

**Textbooks:**

1. Zeid, Ibrahim, "Mastering CAD/CAM", Tata McGraw-Hill, 2007.
2. Chandrupatla, T. R., Belegundu, A. D., "Introduction to Finite Elements in Engineering", 3<sup>rd</sup> Edition, Prentice Hall of India, 2005, New Delhi.
3. Narayana K. L., Kannaiah P., Venkata Reddy K., "Machine Drawing", 3<sup>rd</sup> Edition, New Age International Publishers, New Delhi.

**Reference books:**

1. Srinivasa Prakash Regalla, "Computer Aided Analysis and Design", IK International Publishers, New Delhi, 2010.

**Course Plan:**

| Lecture No.  | Learning objectives  | Topics to be covered   | Chapter in the Text Book |
|--|--|--|--------------------------|
| <b>(A) Computer Aided Geometric Modeling (GM) and Design</b> |  |  |                          |
| 1-3  | CAD software and CAD hardware                                    | Introduction, 3D modeling and viewing, modeling aids and tools, engineering drawings, CAD programming, Computer simulation tools, Primer on MATLAB | TB: Ch-1 to 4            |
| 4-6  | Parametric Curves: Mathematical modeling and computer simulation | Geometric Modeling: Curves, theory and MATLAB modeling   | TB: Ch-6                 |
| 7-9  | Parametric Surfaces: Mathematical modeling                       | Geometric Modeling: Surfaces and NURBS, theory and MATLAB modeling   | TB: Ch-7 & 8             |



|   |   |   |                                    |
|---|---|---|------------------------------------|
|   | and computer simulation   |   |                                    |
| 10-12   | Parametric Solids:<br>Mathematical modeling<br>and computer simulation                    | Geometric Modeling: Solids and Features, theory<br>and Pro/E modeling   | TB: Ch-9                           |
| <b>(B) Integration of GM with Computer Aided Engineering (CAE) and other Applications</b> |   |   |                                    |
| 13-14   | CAD/CAM/CAE/AM data<br>exchange formats   | IGES, STL, STEP, DXF, WRL formats   | TB: Ch-12                          |
| 15-26   | Computer Aided<br>Engineering (CAE) using<br>Finite Element Analysis<br>(FEA)             | Fundamental concepts, matrix algebra and<br>Gaussian elimination, one-dimensional problems,<br>two-dimensional problems, beams and frames,<br>3D problems, scalar field problems, dynamic<br>problems | TB: Ch-17 &<br>RB1: Ch-11 &<br>RB2 |
| 27-28   | Introduction to Rapid<br>Prototyping using Additive<br>Manufacturing (AM)/3D-<br>printing | Virtual prototyping versus physical prototyping,<br>polymer AM technologies for prototyping, CAD<br>neutral formats for AM  | RB1: Ch-17                         |

**Practicals (Each practical is evaluative): (These are the minimum suggested; actual practical topics to be covered may be more)**

| Prac No | Learning Objective   | Reference | Sections in Reference                                       |
|---------|--|-----------|---|
| 1       | Solid Modeling Practice on<br>CREO: Simple models,<br>assembling components into<br>products, Obtaining Machine<br>Drawing from CAD solid models | T3        | 3.14, 3.17-3.43   |
| 2       | Shafts, mechanical springs,<br>screws, fasteners and bolted<br>joints  | T3        | 8.3 to 8.7, 8.10, 8.11, 6.12 & 6.13 & 6.14 &<br>6.15, 18.11 |
| 3       | Spur/helical/bevel gears   | T3        | 20.2, 19.6, 19.10, 19.23                                    |
| 4       | Bearings   | T3        | 12.14, 12.16, 12.17, 12.2 to 12.9, 18.1 to 18.6             |
| 5       | clutches, brakes, couplings  | T3        | 18.12, 18.13  |
| 6       | belts, sprocket and chain  | T3        | 9.1 to 9.7  |
| 7       | FEA of trusses   |           |   |
| 8       | FEA of beams and frames  |           |   |
| 9       | FEA 2D structural problems   |           |   |
| 10      | FEA of 2D heat transfer problem  |           |   |
| 11      | FEA of 3D structural problem   |           |   |
| 12      | Comprehensive Practical Examination  |           |   |

#### Evaluation Scheme:

| Component | Duration<br>(min) | Weightage<br>(%) | Date & Time | Nature of<br>Component |
|-----------|-------------------|------------------|-------------|------------------------|
|-----------|-------------------|------------------|-------------|------------------------|



|                           |     |    |                               |             |
|---------------------------|-----|----|-------------------------------|-------------|
| Mid-semester Examination  | 90  | 25 | 15/03 3.30pm to 5.00pm        | Closed Book |
| Practicals                | -   | 20 | Mon/Wed:<br>D208: 4 & 5 hours | Open Book   |
| Tutorials                 | -   | 15 | Wed - 1                       | Open Book   |
| Comprehensive Examination | 120 | 40 | 18/05 AN                      | Open Book   |

**Chamber Consultation Hour:** To be announced in the lecture class.

**Notices:** All notices on CMS. **Students are required to register in the CMS with their full name and full ID No as per the ID Card.**

**Make-up Policy:** Only for genuine ill-ness cases.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**

