

# SECOND SEMESTER 2023-2024

Course Handout Part II

Date: 09-01-2024

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 : Dr. Partha Saradhi G, V. Vamshi, Vicky Lad, Aditya Nema, Suswanth Poluru, Himanshu Shukla

# 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:

TB1) Zeid , Ibrahim, “Mastering CAD/CAM”, Tata McGraw-Hill, 2007.

TB2) Chandrupatla, T. R., Belegundu, A. D., “Introduction to Finite Elements in Engineering”, 3rd Edition, Prentice Hall of India, 2005, New Delhi.

TB3) Narayana K. L., Kannaiah P., Venkata Reddy K., “Machine Drawing”, 3rd Edition, New Age International Publishers, New Delhi.

# Reference books:

RB1) Srinivasa Prakash Regalla, “Computer Aided Analysis and Design”, IK International Publishers, New Delhi, 2010.

# Course Plan:

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| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| **(A) Computer Aided Geometric Modeling (GM) and Design** | | | |
| 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 | TB1: Ch-1 to 4 |
| 4-6 | Parametric Curves: Mathematical modeling and computer simulation | Geometric Modeling: Curves, theory and MATLAB modeling | TB1: Ch-6 |

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| 7-9 | Parametric Surfaces: Mathematical modeling  and computer simulation | Geometric Modeling: Surfaces and NURBS, theory and MATLAB modeling | TB1: Ch-7 & 8 |
| 10-12 | Parametric Solids: Mathematical modeling  and computer simulation | Geometric Modeling: Solids and Features, theory and Creo modeling | TB1: Ch-9 |
| **(B) Integration of GM with Computer Aided Engineering (CAE) and other Applications** | | | |
| 13-14 | CAD/CAM/CAE/AM data exchange formats | IGES, STL, STEP, DXF, WRL formats | TB1: Ch-12 |
| 15-26 | Computer Aided Engineering (CAE) using Finite Element Analysis (FEA) | Fundamental concepts, matrix algebra and Gaussian elimination, one-dimensional problems, two-dimensional problems, beams and frames,  3D problems, scalar field problems, dynamic problems | TB2: Ch-1 to Ch-11 |
| 27-28 | Introduction to Rapid Prototyping using Additive Manufacturing (AM)/3D-  printing | Virtual prototyping versus physical prototyping, polymer AM technologies for prototyping, CAD 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)**

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| **Prac No** | **Learning Objective** | **Reference** | **Sections in Reference** |
| 1 | Solid Modeling Practice on CREO: Simple models, assembling components into products, Obtaining Machine  Drawing from CAD sold models | TB3 | 3.14, 3.17-3.43 |
| 2 | Shafts, mechanical springs, screws, fasteners and bolted joints | TB3 | 8.3 to 8.7, 8.10, 8.11, 6.12 & 6.13 & 6.14 &  6.15, 18.11 |
| 3 | Spur/helical/bevel gears | TB3 | 20.2, 19.6, 19.10, 19.23 |
| 4 | Bearings | TB3 | 12.14, 12.16, 12.17, 12.2 to 12.9, 18.1 to 18.6 |
| 5 | clutches, brakes, couplings | TB3 | 18.12, 18.13 |
| 6 | belts, sprocket and chain | TB3 | 9.1 to 9.7 |
| 7 | FEA of trusses | TB2 | Ch-4 |
| 8 | FEA of beams and frames | TB2 | Ch-5 |
| 9 | FEA 2D structural problems | TB2 | Ch-6 |
| 10 | FEA of 2D heat transfer problem | TB2 | Ch-10 |
| 11 | FEA of 3D structural problem | TB2 | Ch-9 |
| 12 | Comprehensive Practical Examination | | |

# Evaluation Scheme:

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| **Component** | **Duration (min)** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Mid-semester Examination | 90 | 25%=50M | 14/03 - 9.30 - 11.00AM | Closed Book |
| Practicals |  | 20%=40M | D208-A & B | Open Book |
| Tutorials |  | 15%=30M | Sat - 5 | Open Book |
| Classroom Interaction Tests (Quizzes) | 10 to 15 min | 5% =10M |  | Closed Book |
| Comprehensive Examination | 180 | 35%=70M | 13/05 FN | Closed 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 illness 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