BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 18.01.2021

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 F342**
Course Title : **COMPUTER AIDED DESIGN**
Instructor-in-Charge : Murali Palla, murali.palla@pilani.bits-pilani.ac.in
Instructor(s) : Murali Palla, Amit Rajnarayan Singh, Amol Marathe
Tutorial/Practical Instructors: Deshmankar Atharv Pramod (RS)

1. Course Description: CAD software and CAD hardware. Mathematical modeling of parametric curves, surfaces and solids, and their computer simulation on spreadsheets and using specialized solid modeling packages. CAD/CAM data exchange. Introduction to finite element analysis and FEM practice on a specialized CAE package. Rapid prototyping. Students will be required to do several assignments and one CAD project. (Reproduced from Bulletin)

2. Scope and Objective of the Course:
(a) Geometric transformations and projections.
(b) Curves and Surfaces.
(c) Solid modeling.
(d) Finite element method.

Objectives:
1. Develop intuitive understanding of geometry and topology of shapes
2. Mathematical modeling
3. Programming and Modeling of CAD data.

3. Text Books:
T1. Ibrahim Zeid, Mastering CAD/CAM, McGraw Hill.
T2. Lecture notes provided by the instructor.
T3. Introduction to Finite Element Method by JN Reddy, McGraw Hill.

4. Reference Books:

R1. Anupam Saxena and Sahay, Computer Aided Engineering Design, Springer Publications.

R2. Computer Graphics and Geometric Modeling by David Solomon, Springer Publications.

5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1.	Introduction to Python, Geometric transformations and projections. Affine transformations, Projective transformations, 3D rotations	T1 & T2	Develop intuition. Mathematical analysis. Program in computer.
2.	Curves and Surfaces: Bezier curves, B-Splines, NURBS Tensor surfaces, Coon's surface patch, Generalized sweep surfaces. Curvature and Isometry	T1, T2, & R1	Develop intuition. Mathematical analysis Program in computer.

3.	Solid Modeling, Constructive Solid Geometry, Boundary Representation, Euler Characteristic Software: OpenSCAD, gmsh	T1, T2	Develop intuition and program in computer.
4.	Finite element method. 1. Direct Stiffness Method 2. Weighted residual methods, Galerkin method, FEM for 1D systems. Software: FEniCS	T3	Mathematical analysis and modeling in computer.

6. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of component (Close Book/ Open Book)**
Mid-Semester Test	90 min.	25	<TEST_1>	OB
Comprehensive Examination	3 h	30	15-5-2021	OB
Tutorial Tests	50 min	20	TBA	Best two out of three
Assignments	Approx. 1 week for each assignment	25	TBA	OB

7. Chamber Consultation Hour: TBA

8. Notices: Nalanda

9. Make-up Policy: Provided only for emergencies at the discretion of I/C. No makeup for Tutorials since best 2 of 3 to be considered.

10. Note (if any): High standards of academic honesty is expected from all the students. The assignments of the course are to be done using Python program. Plagiarism is strictly discouraged in any form. Any detection of plagiarism will lead to zero in the full component of the exam.

Instructor-in-charge
Course No. ME/MF F342