Course Contents

(Instructor Dr. Prashant K. Jain)

ME 307 Computer Aided Design [3–0–0–4] ***Prerequisites: DS 101***

Introduction:
Objective, scope, overview, CAD software, mathematical background, applications

Transformations:
Rotation, translation, scaling, reflection, shear and combined transformations in 2D and 3D, computer-aided assembly

Projections:
Orthographic, axonometric, oblique and perspective projections

Curves:
Parametric representation of analytic curves, representation of synthetic curves- Hermite/ Ferguson, Bezier, B-spline, rational curves, NURBS/NUBS, curve manipulations, Analytical properties

Surfaces:
Surface representation, parametric representation of analytic surfaces- plane, ruled, surface of revolution etc., representation of synthetic surfaces- Hermite, Bezier, B-spline, coons, sculptured etc., surface manipulations, curves on surfaces, surface with irregular boundaries, analytic properties, application in reverse engineering, design of turbine blades etc.

Solids:
Introduction, representation of solids, fundamentals of solid modeling, solid representation schemas (B-rep, CSG, Sweep, ASM etc), solid manipulations, solid modeling-based applications in manufacturing and assembly (CNC machining, Rapid prototyping).

Advanced Topics:
Geometric modeling using point clouds, CAD/CAM data exchange

Text Books:

1. Zeid, Ibraheim, CAD/CAM: Theory and Practice, Revised First Edition, Tata McGraw Hill, 2007.
2. Rogers, D.F and Adams, J.A., Mathematical Elements for Computer Graphics, Tata McGraw Hill, 2002.

Reference Books:

1. Mortenson, Michael E., Geometric Modeling, Third Edition, Industrial Press Inc., 2006.
2. Saxena and Sahay, Computer Aided Engineering Design, Anamaya Publications
3. Faux, I. D. and Pratt, M. J., Computation Geometry for Design and Manufacture, John Wiley (Ellis Horwood Ltd.), 1983.
4. Choi, B. K., Surface Modeling for CAD/CAM, Elsevier.
5. Farin, Gerald, Curves and Surfaces for Computer Aided Geometric Design – A Practical Guide, Academic Press Inc.1991.
6. Lee, Kunwoo, Principles of CAD/CAM/CAE Systems, Addison Wesley, 1999.
7. Yamaguchi, Curves and Surfaces in Computer Aided Geometric Design, Springer, 1988.
8. Ryan, D. L., Computer-Aided Graphics and Design, Marcel Dekker Inc., 1994.