



*Faculty: Science*  
*Department: Basic Sciences*

## MODULE SYLLABUS

**Module Name: Special Topics (Differential Geometry)**

**Module Number:** 250492  
**Credit Hours:** 3 Credit Hours  
**Prerequisite:** Math 250201  
**Time:**  
**Semester:**

**Textbook:** Differential Geometry and its Applications.  
Second Edition by John Oprea. Prentice Hall 2004

**Other References:**

1. Elementary Topics in Differential Geometry. By J.A. Thorpe. Springer 1979
2. Differential Geometry. By J.J. Stoker. John Wiley 1969
3. Introduction to Geometry. By H.S.M. Coxeter. John Wiley 1969, Second Edition

**Instructor:**

**Course Objectives:** Learning a full account of differential geometry of curves and surfaces. In addition to have the students comprehend and fully grasp the 3-dimensional picture for curves and surfaces and their characteristics.

**Course Contents:**

- A) The geometry of curves: Arclength parametrization, Frenet Formulas, implications of curvature and torsion, Green's Theorem and their isoperimetric inequality (2 weeks)
- B) Surfaces: the geometry of surfaces, Linear algebra of surfaces, normal curvature (3 weeks)
- C) Curvature: Calculating curvature, surfaces of revolution, Gauss curvature, some effects of curvature, surfaces of Delaunay (3 weeks)
- D) Constant Mean Curvature Surfaces: Minimal surfaces, constant Mean Curvature, area minimization, Harmonic functions, the isothermal coordinates, the Weierstrass-Enneper Representation (4 weeks)
- E) Geodesic, Metrics and Isometrics: The geodesic equations and the Clairut relation, isometries and conformal maps (3 weeks)

**Attendance:** University regulations will be applied.

**Assessment:**

- Two one hour exams 40 points
- Quizzes and assignments 10 points
- Final Exam 50 points