DIFFERENTIAL GEOMETRY OF CURVES AND SURFACES

MTH 406, SEMESTER 2, 2016-2017

Course Information

- **Instructor:** Dr. Sanjay Kumar Singh <sanjayks@iiserb.ac.in>
- **Office:** 210, Academic Building 1.
- **Email:** sanjayks@iiserb.ac.in.
- **Webpage:** http://home.iiserb.ac.in/∼sanjayks.

- **Office Hour:** Wednesday $5.00 - 6.00$ PM. If you cannot come during my office hours please send me an email to make an appointment.

This course is an introduction to the area of Differential Geometry, a classical subject of modern mathematics. We will be primarily deals with curves and surfaces in three dimensional space. To study the geometry of curves and surfaces in $\mathbb{R}^3$ we will use multivariable calculus, linear algebra and also some ordinary differential equations.

Syllabus:

- **Pre-requisites:** Some basic results from the courses MTH 102, MTH 201, MTH 306, MTH 311.
- **Curves:** curves in space, tangent vector, arc length, curvature, torsion, Frenet formulas
- **Surfaces:** parametrization, tangent plane, orientability, first fundamental form, area, orientation, Gauss map, second fundamental form, Gauss curvature, ruled and minimal surfaces
- Geodesics, isometries of surfaces, Gauss Theorema Egregium, Codazzi-Mainardi equations
- **Gauss-Bonnet theorem** for compact surfaces

The official Course Syllabus is as given in the Course Contents booklet

$$http://acad.iiserb.ac.in/cc/mth406.php$$

Textbook:

- **Pressley, Elementary Differential Geometry, Springer, Indian reprint,** 2004**.**

Reference books:

- Manfredo do Carmo, Differential Geometry of Curves and Surfaces, Prentice Hall, 1976.
- Curves and Surfaces in Euclidean Space, by S.S. Chern, in: Studies in Global Geometry and Analysis, edited by S.S. Chern, Studies in Mathematics, Volume 4, pp.1656.
- D. J. Struik, Lectures on Differential Geometry, Dover, 1988.
- Barrett ONeill, Elementary Differential Geometry, Second edition, Academic Press (Elsevier), 2006.
- General Investigations of Curved Surfaces of 1827 and 1825, by Carl F. Gauss.
- Differential Geometry of Curves and Surfaces by Thomas F. Banchoff, Stephen T. Lovett.
- Elementary Topics in Differential Geometry (Undergraduate Texts in Mathematics) by John A. Thorpe.

Assignment. There will be 4 assignment in this course. The homework assigments will be posted on the course webpage.

You are encouraged to work together on assignment problems, but **everyone has to write up the solutions independently**. Please order the pages and staple the pages. Unreadable homework will not be corrected. No late homework will be accepted.

Home work and class exercise. In every class you will get some home work which you don't need to submit. You can discuss it in office hours.

Grading Policy:

- Final Semester Exam: 50%
- Mid Semester Exam: 25%
- Quiz: 10%
- Weightage for other components (surprize quizzes/assignments/attendance/class presentation etc.) 15%.

Quiz: There will be one planned quiz and two surprise quizess in the semester. Proposed date for planned quiz is on 25/01/2017.

***.** In case of any further questions regarding the course, please send me an email.