THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MATH 4030 (First term, 2016-17)
Differential Geometry
Course Outline

Course Description

This class is intended to be a first course on differential geometry at the advanced undergraduate level. It covers basic theory on curves, and surfaces in the Euclidean three space. Topics include: regular curves, Frenet formulas, local theory of curves, global properties of curves such as isoperimetric inequality, regular surfaces, 1st and 2nd fundamental form, Gaussian curvature and mean curvature, Gauss map, special surfaces such as ruled surfaces, surfaces of revolution, minimal surfaces, intrinsic geometry: geodesic, and Gauss-Bonnet Theorem.

Pre-requisites

Students taking this course are expected to have thorough knowledge in advanced calculus (at the level of MATH 2010 and 2020), linear algebra (at the level of MATH 1030 and 2040), and elementary understanding of ordinary differential equations (MATH 3270), point-set topology (MATH 3070) and complex variables (MATH 2230).

Instructor

- LI Man-chun Martin (Office: LSB 236. Email: `martinli@math.cuhk.edu.hk`)

Teaching Assistants

- CHAU Chi Fai (Office: LSB 222B. Email: `cfchau@math.cuhk.edu.hk`)
  Office Hours: please check on the course webpage

Time and Venue

- **Lectures**: Tu 10:30AM - 12:15PM; Th 10:30 - 11:15AM
- **Tutorials**: Th 11:30AM - 12:15PM
- **Venue**: LSB C2

Lectures, Tutorials and Homeworks

Tutorials form an integral part of the course and students are expected to attend all the lectures and tutorials. While the lectures will cover more theoretical concepts, the tutorials will focus more on the computational aspects of the subject. One cannot learn and fully appreciate the concepts without working out lots of examples and calculations. Therefore, students are expected to complete the homework assignment by themselves (peer discussions are encouraged though but students are expected to do their own write-ups). Note that plagiarism is taken very seriously by the University and any related offence will lead to disciplinary action including termination of studies at the University.

Textbook and References

- (Required) M. do Carmo, *Differential Geometry of Curves and Surfaces*, Prentice Hall, 1976
- S. Montiel and A. Ros, *Curves and Surfaces*, 2nd ed., Graduate Studies in Mathematics, Vol. 69, American Mathematical Society, 2009
- W. Kühnel, *Differential Geometry: Curves - Surfaces - Manifolds*, 2nd ed., Student Mathematical Library, Vol 16. American Mathematical Society, 2005
- M. do Carmo, *Differential Forms and Applications*, Universitext, Springer-Verlag, 1998

Assessment Scheme

- **Homework**: 10%

  There will be weekly homework assignments, which is usually posted on Tuesday and due the following Tuesday at 5PM. To ensure fairness, we will be strict on the homework policy that no late homework will be accepted (unless there is a legitimate reason with proof of evidence as appropriate). Each homework will consist of "*Problems*" and "*Suggested Exercises*". Students are supposed to write up all the answers to the questions in the *Problems* section, some of which will be graded by the TA to determine the homework score towards your course grade. Solutions to the *Problems* section will be posted on the course webpage within a week after the due date. The lowest homework score will be dropped.

- **Midterm**: 40%

  There will be one in-class midterm on October 13 (Thursday) 10:30AM - 12:15PM at the usual classroom (LSB C2) for lectures and tutorials. No make-up midterms will be given unless under very special circumstances with proof of evidence, which will be assessed case-by-case at the discretion of the instructor.

- **Final Examination**: 50%

  The final examination will be centralized by the University and it will be within the official examination period of December 7 - 23, 2016. The exact date and time will be announced around mid-October. Please do not make any travel plan until you know the examination dates. No make-ups or special arrangements can be made by the instructor or the Department.

Course Webpage

Please check regularly the following course webpage for course materials and announcements:

`http://www.math.cuhk.edu.hk/course/1617/math4030`