

THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MATH 4030 (First term, 2015-16)
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 analysis (MATH 2230).

Instructor

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

Teaching Assistants

- Huang Shaochuang (Office: LSB 222A. Email: schuang@math.cuhk.edu.hk)
Office Hours: Tu 1:30-6:15PM, W 8:30AM-12:15PM, F 8:30AM-12:15PM
- Wang Qizhi (Office: LSB 233, Email: qzwang@math.cuhk.edu.hk)
Office Hours: M 2:30-5:00PM, W 2:30-5:00PM, F 8:30-12:00PM

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 weekly 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

We will cover selected parts of Chapters 1-4 of the following book:

- W. Kühnel, *Differential Geometry: Curves - Surfaces - Manifolds*, 2nd edition, Student Mathematical Library, Vol 16. American Mathematica Society, Providence, RI, 2005

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.

- **Midterms:** 40%

There will be two in-class midterms. One on September 22 (Tuesday) and one on October 27 (Tuesday) at the usual classroom (LSB C2) for lectures. No make-up midterms will be given. If you are not able to attend any of the midterms, please inform the instructor as soon as possible. Under special circumstances with proof of evidence, case-by-case arrangements could be made at the discretion of the instructor. In any case, students must be present in at least one of the midterms to pass the course.

- **Final Examination:** 50%

The final examination will be centralized by the University and it will be within the official examination period of December 9 - 23, 2015. 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.

Reference materials

- M. do Carmo, *Differential Geometry of Curves and Surfaces*, published by Prentice Hall
- M. do Carmo, *Differential Forms and Applications*, Universitext, Springer-Verlag

Course Webpage

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

<http://www.math.cuhk.edu.hk/course/1516/math4030>