

School of Mathematical Sciences
PURE MTH 3022
Geometry of Surfaces III, Semester 2, 2011

Information about the course

1. Description: The geometry of surfaces is a classical subject which remains important today in fields as diverse as string theory and nano-materials. From a mathematical perspective it provides an excellent introduction to the ideas of contemporary Riemannian geometry.

2. Graduate attributes: 1, 2, 3, 4, 5, 6.

3. Objectives:

- Understand basic topology and differentiation in \mathbb{R}^n .
- Understand and be able to apply the inverse and implicit function theorems.
- Understand and be able to work with submanifolds in their various forms.
- Understand and be able to calculate with the geometry of curves.
- Understand and be able to calculate with the geometry of surfaces.
- Understand integration on surfaces and be able to calculate such integrals.
- Understand the Gauss-Bonnet theorem and be able to apply it.

4. Content:

- Introduction and review of topology on \mathbb{R}^n . (2 lectures)
- Differentiable functions on \mathbb{R}^n . (5 lectures)
- Inverse and implicit function theorems. (3 lectures)
- Submanifolds. (4 lectures)
- Curves. (3 lectures)
- Surfaces. (3 lectures)
- Integration on submanifolds. (7 lecture)
- Gauss-Bonnet theorem. (3 lectures)

As this course has not been taught for 10 years there may be some minor variation on the topic list and timings indicated here.

5. Linkage: Prerequisite is MATHS 1012 Mathematics I or MATHS 2105 Mathematics IIM. MATHS 2101 Multivariable and Complex Calculus or MATHS 2202 Engineering Mathematics II is assumed knowledge. This course is a useful background to the honours course Differential Geometry.

6. Recommended texts:

- Manfredo de Carmo: *Differential Geometry of Curves and Surfaces*. 514.75 C287
- John A. Thorpe: *Elementary topics in differential geometry*. 514.7 T519e
- Peter Baxandall and Hans Liebeck: *Vector calculus*. 517.2 B355v
- Martin Lipschutz: *Schaum's outline of theory and problems of differential geometry*. 513.73 L767
- Alfred Gray: *Modern differential geometry of curves and surfaces*. 514.7 G778m
- Wendell Fleming: *Functions of several variables*. 517.53 F598.2

7. Lectures: There are three lectures a week: Tuesday 2.10 in Engineering Mathematics EMG06. Wednesday 1.10 in Engineering Annex, 314 and Friday 2.10 in Innova21, basement B21. Tutorials will be held in the Wednesday lecture during even weeks.

8. Arrangements for Assignment: There will be five assignments handed out on Fridays of odd weeks starting with week 1. Some of the questions on the Assignment will be collected and marked. They will be due on the Tuesdays: 9th August, 23 August, 6th September, 20th September and 18th October.

9. Consulting hour: I will assign a consulting hour in the first lecture.

10. Assessment: The final grade will be made up of a 2 hour exam worth 70%, class exercises worth 15% and a short mid-term test worth 15%. The mid-term will be held during the lecture time on Wednesday the 21st of September.

11. Supplementary Examinations: See the University policy and application forms here: <http://www.adelaide.edu.au/student/exams/supps.html>.

12. Plagiarism: Please remember to attach a completed plagiarism declaration to each assignment. A copy of the form is on the course website.

13. Course web site: Anything I print and handout I will also put up on the course website at <http://www.adelaide.edu.au/student/exams/supps.html>. There is a link on the myUni web page to the course web page.

14. Contact details: I am easiest to contact by email at michael.murray@adelaide.edu.au. My office is Room 7.29 of the Innova Building. This is behind a locked door so you need to ring me on 8313 4174 so I can come and let you in. When you come out of the lift turn right and you will see a door with a phone next to it. You can ring from there.

Professor Michael Murray
2011/7/26