SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**675**	**Differential Geometry**	**4**	**3**	**0**	**1**	**9**		2^1-2^2	**English**

A. Course Description

This course introduces the most important ideas and theoretical results of differential geometry. It deals with plane curves and two dimensional surfaces in three-dimensional space, where parameterizations of curves and surfaces are extensively utilized. The course also introduces some of the global properties of plane curves, as well as the Gauss map and its properties. Gaussian and normal curvatures of surfaces are introduced. Applications and heuristics are mentioned occasionally. Tensors shall be utilized where applicable.

B. Course Outcomes

At the end of this course the student will be able to*:*

1. Acquire the basic mathematical understanding of modern approaches to the study of (the geometry of) Plane Curves in R^2 and Regular Surfaces in $R^{3.}$
2. Study properties of curves and surfaces, which allow the understanding of the physics of moving particles and objects, as well as the geography of the earth and planets.
3. Discuss some applications extending to the theory of general relativity.

C. References:

1. **E. Kreyszig**, *Differential Geometry*, Dover Publications, 2012. (Main Reference)

Required Textbook

2. **A. Pressley**, *Elementary Differential Geometry*; Springer-Verlag, 1st Ed., 2010.
3. **Numerical_Methods_for_ODEs**, *Differential Geometry: Curves, Surfaces, Manifolds*; American Mathematical Society; 2nd Ed. 2004.

Course Website: Google Classroom Webpage:http://www.imamm.org/

D. Topics Outline

1. **Plane curves**: Curves' parameterizations, Arc length, Curvature and torsion, Frenet formulas, The local canonical form, Global properties of plane curves, Simple closed curves.
2. **Regular Surfaces in $\mathbb{R}^3$:** Surfaces' parameterizations, Regular surfaces and regular values, Change of parameters, A regular parametrized Surface, Tangent planes, Tangent spaces and normal vectors, The first fundamental form of a regular surface.
3. **The Geometry of Gauss Map**: Gauss map and its properties, Differential of the Gauss map, Meusnier's theorem, The second fundamental form of a regular surface, The maximum and the minimum normal curvatures, Gaussian and Mean curvatures, The Gauss map in local coordinates, Equations of Weingarten, Examples.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm :** 8^{th} or 9^{th} week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16^{th} week.

Your course grade will be based on your semester work as follows:

Midterm : 30 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 30 %	

The grading distribution:

A^+	A	B^+	B	C^+	C	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[0, 70)

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3

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