SUBJECT TEACHING GUIDE

G97 - Global Theory of Surfaces

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2020-2021

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Mathematics			Type and Year	Compulsory. Year 4 Compulsory. Year 3
Faculty	Faculty of Sciences				
Discipline	Subject Area: Geometry and Topology Module: Compulsory Subjects				
Course unit title and code	G97 - Global Theory of Surfaces				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	FERNANDO ETAYO GORDEJUELA
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Other lecturers	

3.1 LEARNING OUTCOMES
- Students will calculate the fundamental group of some basic topological spaces
- Students will classify closed surfaces according their topological invariants
- Students will decide when a surface is orientable
- Students will distinguish the intrinsic and the extrinsic properties of a surface and calculate the geodesics of some basic surfaces
- Students will decide if two surfaces are isometric or locally isometric
- Students will apply Gauss Bonnet theorems in order to study the geometry of a surface

4. OBJECTIVES

Distinguish topological spaces according their homotopy group
Know the classification of closed surfaces, determining the topological invariants
Know the main properties of geodesics
Know the Gauss-Bonnet theorem, linking geometry and topology of a surface

6. COURSE ORGANIZATION

CONTENTS	
1	Introduction to the fundamental group. Fundamental group of the product and quotient spaces. Retracts. Homotopy type of a space. Brouwer Fixed-point theorem.
2	Toplogical surfaces. Triangullations, Euler characteristic and genus of a closed surface. Classification theorem of closed surfaces.
3	Regular surfaces. Orientability. Gauss map.
4	Geodesic and normal curvatures. Geodesic lines. Intrinsic geometry of a surface.
5	Smotth maps and isometries.The Gauss curvature is preserved under local isometries.
6	Gauss-Bonnet theorems.
7	Final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
One hour written exam	Written exam	No	Yes	16,00
One hour written exam	Written exam	No	Yes	16,00
One hour written exam	Written exam	No	Yes	16,00
Final exam	Written exam	Yes	Yes	52,00
TOTAL				100,00

Observations

(a) The final mark is the best of:
(1) The average of all the exams.
(2) The mark of the final exam.
(b) One passes the subjet when the averaged marks are over 5, having 3/10 or more in the final exam. In other case, the final mark is 4.9. The September exam, if necessary, is up to 10 points.

Observations for part-time students

If you are a part-time student, the two midterm one-hour exams can be done with the final exam.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Massey, William S.: Introducción a la topología algebraica. Barcelona [etc.] : Reverté, 1972.

Millman, Richard S.; Parker, George D.: Elements of differential geometry. Englewood Cliffs, N.J. : Prentice-Hall, cop. 1977.

Etayo, Fernando: Elementos de Topología Algebraica: Grupo Fundamental y Clasificación de Superficies. Sanz y Torres, 2016.