SUBJECT TEACHING GUIDE

G96 - Geometry of Curves and Surfaces

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Mathematics			Type and Year	Compulsory. Year 3 Compulsory. Year 2
Faculty	Faculty of Sciences				
Discipline	Subject Area: Geometry and Topology Module: Compulsory Subjects				
Course unit title and code	G96 - Geometry of Curves and Surfaces				
Number of ECTS credits allocated	6	Term		Semester based (2)	
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 recognize the nature of the points of a regular space curve and parametrize it by arc length.
- Students will know how to calculate of the Frenet trihedron, Frenet formulas, curvature and torsion of a curve, and recognize certain curves knowing its curvature and torsion.
- Students will recognize the nature of the points of a regular surface in space, and manage the tangent plane and the normal line to a surface at a point.
- Strdents will be able to calculate the fundamental forms, Gauss curvature, mean curvature and principal curvatures of a surface.
- Students will classify the points of a surface, determine the indicatrix of Dupin, find the lines of curvature, and conjugate and asymptotic directions.
- Students will use the previous invariants to recognize a surface and represent it graphically.
- Students will construct examples of surfaces of revolution, ruled surfaces, developable surfaces and minimal surfaces.
- Sudents will know and apply the Theorema Egregium of Gauss and the fundamental theorem of surfaces to the study of surfaces.

4. OBJECTIVES
Use the Differential and Integral Calculus and Topology for the study of curves and surfaces in three-dimensional real space.
Know and handle the basic concepts and results of the Theory of Curves and Surfaces.
Know rigorous proofs of some theorems and use them to solve geometric problems.
Know how to distinguish between intrinsic and extrinsic properties of a surface.

6. COURSE ORGANIZATION	
CONTENTS	
1	VECTOR GEOMETRY OF R^2 AND R^3.
2	REGULAR CURVES.
3	CURVATURE AND TORSION.
4	FRENET FORMULAS. APPLICATIONS.
5	IMPORTANT CURVES.
6	MAPS FROM R^2 INTO R^3.
7	THE NOTION OF A SURFACE.
8	THE FIRST AND SECOND FUNDAMENTAL FORMS.
9	NORMAL CURVATURE AND THE WEINGARTEN MAP.
10	MEAN AND GAUSS CURVATURES. PRINCIPAL CURVATURES AND PRINCIPAL DIRECTIONS.
11	IMPORTANT SURFACES: Implicit surfaces, surfaces of revolution, ruled surfaces, developable surfaces and minimal surfaces.
12	THEOREMA EGREGIUM OF GAUSS AND FUNDAMENTAL THEOREM OF SURFACES.
13	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. There is another exam, if necessary, which is up to 10 points.

Observations for part-time students

If you are a part-time student, you have the same evaluation system.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

DO CARMO, M. (1990). Geometría Diferencial de Curvas y Superficies. Alianza.

LIPSCHUTZ, M. (1990). Geometría Diferencial. Schaumm-McGraw Hill.

MILLMAN, R.S. and PARKER, G.D. (1977). Elements of Differential Geometry. Prentice-Hall.