# COURSE OUTLINE

## GENERAL

| | | | |
|---:|:---|---:|:---|
| **SCHOOL** | School of Science | | |
| **ACADEMIC UNIT** | Department of Mathematics | | |
| **LEVEL OF STUDIES** | Undergraduate | | |
| **COURSE CODE** | MAY522 | **SEMESTER** | 5 |
| **COURSE TITLE** | Elementary differential geometry | | |

| **INDEPENDENT TEACHING ACTIVITIES** <br> *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|:---|:---:|:---:|
| | 5 | 7.5 |
| | | |
| | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |
| **COURSE TYPE** <br> *general background,* <br> *special background, specialised general knowledge, skills development* | General background | |
| **PREREQUISITE COURSES:** | Linear Algebra, Calculus | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | greek | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes (in English) | |
| **COURSE WEBSITE (URL)** | http://users.uoi.gr/tvlachos/ | |

## LEARNING OUTCOMES

**Learning outcomes**
*The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*

*Consult Appendix A*

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*

- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*

- *Guidelines for writing Learning Outcomes*

It is an introductory course on differential geometry. The aim is to introduce and study geometric properties of regular curves (both plane and space) and regular surfaces. Fundamental notions of differential geometry of curves and surfaces are introduced and studied. Among them is the notion of curvature.  The study requires tools from Linear

Algebra and Calculus of several variables.

Upon completion of the course, the student should be familiar with basic notions of differential geometry like the one of curvature, first and second fundamental form, isometries between surfaces and their geometric meaning.

1) Work autonomously.
2) Work in teams.
3) Develop critical thinking skills.

**SYLLABUS**

Plane curves, arclength, curvature, Frenet frame.
Space curves, curvature and torsion, Frenet frame, fundamental theorem of curves.
Surfaces, parametrization, Gauss map, Weingarten map, first and second fundamental form, normal curvature, principal and asymptotic directions, Gaussian and mean curvature, minimal surfaces, Theorema Egregium, Gauss and Weingarten formulas, fundamental theorem of surfaces, developable surfaces.

**TEACHING and LEARNING METHODS - EVALUATION**

| DELIVERY<br>*Face-to-face, Distance learning, etc.* | Direct | | |
|---|---|---|---|
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**<br>*Use of ICT in teaching, laboratory education, communication with students* | | | |
| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*<br><br>*The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS* | **Activity** | | **Semester workload** |
| | Lectures | | 65 |
| | Autonomous study | | 127.5 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | Course total | | **187.5** |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br><br>*Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other*<br><br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | Written final examination | | |

**ATTACHED BIBLIOGRAPHY**

*- Suggested bibliography:*
*- Related academic journals:*

- Δ. Κουτρουφιώτης, Στοιχειώδης Διαφορική Γεωμετρία, Εκδόσεις Leader Books, 2006

- Barrett O' Neil, Στοιχειώδης Διαφορική Γεωμετρία, Πανεπιστημιακές Εκδόσεις Κρήτης, 2002

- Andrew Pressley, Στοιχειώδης Διαφορική Γεωμετρία, Πανεπιστημιακές Εκδόσεις Κρήτης, 2011

- Manfredo do Carmo, Differential Geometry of Curves and Surfaces, Prentice-Hall, 1976