COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM105	**SEMESTER OF STUDIES**	2nd
COURSE TITLE	CALCULUS II		

INDEPENDENT TEACHING ACTIVITIES *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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	5	8
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Background
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP214/ https://eclass.upatras.gr/courses/MATH920/

2. 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*

Upon successful completion of this course the student will be able to:

- use the tools of differential calculus in the study of real functions of one variable: intervals of monotonicity, local and absolute extrema, intervals of concavity, points of inflection, asymptotes, graphs of functions.
- compute indefinite integrals for basic types of functions.
- handle the Riemann integral from a computational as well as from a theoretical point of view, be comfortable with the formulation of the Fundamental Theorem of Calculus and its use in calculating definite integrals of functions.
- apply the definite integral to calculate areas under graphs of functions, volumes of solids of revolution and arc lengths.
- calculate Taylor-Maclaurin polynomials and estimate the Taylor approximation error in the case of basic functions.
- compute improper integrals and decide on the convergence of improper integrals using basic criteria.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	

- Search, analysis and synthesis of data and information using appropriate technologies.
- Decision making.
- Adaptability to new situations.
- Working in an interdisciplinary environment.
- Autonomous Work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Taylor-Maclaurin Theorem. Taylor polynomials, Lagrange formula for the remainder, use of Taylor polynomials in approximating.
Antiderivatives and Indefinite integral. Definition, basic properties, integration by change of variable, integration by parts, integration of rational functions, integration of basic types of functions.
Definite integral (Riemann Integral). Definition, properties, integrable functions, mean value theorems for definite integrals, inequalities between definite integrals, Fundamental Theorem of Calculus, change of variables in definite integrals.
Applications of definite integrals. Calculation of areas, volumes of revolution and arc lengths, functions.
Line integrals. Vector functions, parametric representation of curves, line integrals.
Improper integrals. Types of improper integrals and their calculation, basic properties, convergence criteria for improper integers of nonnegative functions (comparison test, limit test, etc.), absolute integrability of improper integrals, change of variables in improper integrals.

In order to highlight the special educational and didactical aspects of a course, special emphasis is given on the historical evolution and scientific development of the subject as well as on its applications in technology and/or other sciences.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc..*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Supporting learning through • the online platform *eClass* of the Department of Mathematics, and • electronic platform *eClass* of the University of Patras.
TEACHING ORGANIZATION *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.* *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	39
Tutorials	26
Solving suggested exercises	60
Hours of personal study by the student	72
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***200***

STUDENT ASSESSEMNT *Description of the evaluation procedure* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods** Written Final Course Examination (100%) including ✓ Theory, ✓ Exercises, ✓ Applications of the study of real functions of one variable and of the definite integral. Minimum passing grade: 5 Maximum passing grade: 10

5. RECOMMENDED LITERATURE

(in Greek)

- Γεωργίου Δημήτριος, Ηλιάδης Σταύρος και Μεγαρίτης Αθανάσιος. *Πραγματική Ανάλυση*. 2η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Finney Ross L., Weir Maurice D. and Giordano Frank R. *Απειροστικός Λογισμός*. (μετάφραση της 10ης Αμερικάνικης Έκδοσης). Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2015.
- Spivak Michael. *Διαφορικός & Ολοκληρωτικός Λογισμός* (μετάφραση της 4ης Αμερικάνικης Έκδοσης). 2η Έκδοση, Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2015.
- Παπαδημητράκης Μιχαήλ. *Ανάλυση*. (e-book). Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Αποθετήριο "Κάλλιπος", 2016.