COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM310	**SEMESTER OF STUDIES**	6th
COURSE TITLE	COMPLEX ANALYSIS		

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	6
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: REAL ANALYSIS II
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH935/

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*

- Ability to understand the definition of the exponential function and of the branches of the logarithm in the complex plane.
- Ability to understand the notion of complex derivative and ability to use it in order to calculate derivatives of various functions.
- Ability to use the Cauchy-Riemann equations.
- Ability to understand the proof of the local Cauchy's Theorem and its importance in the theory of complex analysis.
- Ability to use Cauchy's integral formula in order to calculate contour integrals.
- Ability to understand Liouville's theorem, analytic continuation and maximum principle .
- Ability to distinguish the various types of isolated singularities of holomorphic functions.
- Ability to expand analytic functions in Taylor and Laurent series.
- Ability to find the residues of various functions.
- Ability to use the Residue theorem in order to calculate real and complex integrals.

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, as well as a critical understanding of data and information using appropriate technologies.
- Decision making.
- Working in an interdisciplinary environment.
- Autonomous Work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking in mathematics.

3. COURSE CONTENT

Algebra of the Complex Plane, n-th root, definition of exponential functions and branches of logarithm. Topology of the complex plane (open, closed and connected sets, sequences, series and continuous functions). Holomorphic functions (Definition, Cauchy-Riemann Estimates, properties and examples). Complex Integration. Cauchy's Theorem for triangles, Cauchy's formula for simple contours and applications (Taylor expansion, calculating integrals, Liouville's Theorem e.tc.), Cauchy's formula for annulus and application (isolated singularities, Laurent expansion, calculation of real and complex integrals).

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*	
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	52
Tutorials	13
Solving suggested exercises	32
Hours of private study of students.	50
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

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:** **Assessment methods:** Written Final Course Examination (100%) including ✓ Theory, ✓ Exercises. Minimum passing grade: 5 Maximum passing grade: 10

5. RECOMMENDED LITERATURE

(*in Greek*)

- Νεγρεπόντης Στυλιανός. *Θεωρία Μιγαδικών Συναρτήσεων μιας Μεταβλητής*. Εκδόσεις Συμμετρία, 1993.
- Μερκουράκης Σοφοκλής Κ. και Χατζηαφράτης Τηλέμαχος Ε. *Εισαγωγή στη Μιγαδική Ανάλυση.* Εκδόσεις Συμμετρία, 2005.
- Marsden Jerrold E. and Hoffman Michael J. (μετάφραση: Παπαλουκάς Λουκάς) *Βασική Μιγαδική Ανάλυση.* Εκδόσεις Συμμετρία, 1994.
- Κραββαρίτης Δημήτριος. *Εφαρμοσμένη Μιγαδική Ανάλυση*. Εκδόσεις Τσότρας, 2016.
- Τσίτσας Νικόλαος. *Εφαρμοσμένα Μαθηματικά*. (e-book). Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Αποθετήριο "Κάλλιπος", 2016.

(*in English*)

- Palka Bruce P. *An Introduction to Complex Function Theory*. Springer, 1991.
- Bak Joseph and Newman Donald J. *Complex Analysis.* 3rd ed., Springer, 2010.