## ■ CC61 - Complex Analysis

**GENERAL**

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| **SCHOOL** | EXACT SCIENCES | | |
| **DEPARTMENT** | MATHEMATICS | | |
| **LEVEL OF STUDIES** | UNDERGRADUATE | | |
| **COURSE CODE** | CC61 | **SEMESTER** | F |
| **COURSE TITLE** | COMPLEX ANALYSIS | | |

| **INDEPENDENT TEACHING ACTIVITIES** | **WEEKLY TEACHING HOURS** | **ECTS** |
|---|---|---|
| Lectures | 5 | 8 |
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| **COURSE TYPE** | Scientific Field |
| **PREREQUISITE COURSES** | Real Analysis |
| **LANGUAGE OF TEACHING AND EXAMINATIONS** | Greek/English |
| **THE COURSE IS OFFERED TO ERASMUS STUDENTS** | YES |
| **COURSE WEBSITE (URL)** | http://eclass.uowm.gr/ |

**LEARNING OUTCOMES**

| **Learning Outcomes** |
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| With this course, the students:<br>• will be familiar with the fundamental notions of topology for the complex plane,<br>• will be able to understand the definition of the branches of the logarithmic function at the complex plane,<br>• will be able to calculate by definition the complex derivative of basic functions, as well as use the Cauchy-Riemann conditions,<br>• will be able to calculate simple complex integrals with both the definition and the Cauchy integral formula, |

- will be able to use the theorems of Liouville and analytic continuation expansion, as well as the maximum/minimum principles, to solve exercises,
- will be able to classify specific points of complex functions and calculate Taylor or Laurent expansions at these points,
- will be able to use the Residue theorem to calculate complex integrals, but also real integrals of a specific form.

**General Competencies**

- Individual work.
- Promotion of free, creative and inductive thinking.

**CONTENT OF THE COURSE**

Complex plane and operations with complex numbers. Topology of the complex plane (open, closed, connected and simply connected sets, sequences, series). Elementary complex functions. Continuous and holomorphic functions. Cauchy-Riemann equations. Complex integration, theorems and Cauchy's integral formula. Taylor expansion, calculus of integrals. Liouville theorem, maximum/minimum principles. Cauchy's formula on a ring. Isolated singularities. Laurent expansion. Residue Theorem, calculation of curves and real integrals.

**TEACHING AND LEARNING METHODS - EVALUATION**

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| **TEACHING METHOD** | In the classroom. |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** | Use of e-class.<br>Communication through face-to-face discussions and e-mails. |
| **TEACHING ORGANIZATION** | |
| **STUDENT EVALUATION** | Written final examination 100%. |

| **Activity** | **Semester Workload** |
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| Lectures | 65 hours |
| Projects | 45 hours |
| Individual Study | 90 hours |
| Course Total (25 hours per ECTS) | 200 hours |

**RECOMMENDED BIBLIOGRAPHY**

1. Betsakos D, Introduction to Complex Analysis, Kyriakidi Press (Greek).
2. Negrepontis S, Theory of Functions of a Complex Variable, Symmetria Press (Greek).
3. Merkourakis S and Chatziafratis T, Introduction to Complex Analysis, Symmetria Press (Greek).
4. Marsden J, Hoffman M, Basic Complex Analysis, Symmetria Press (Greek).