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| 1. Course title: Complex functions lecture | | | | | |
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| 2. Code: | | 3. Type (lecture, practice etc.): lecture | | | |
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| 4. Contact hours: 2 hoursper week | | 5. Number of credits (ECTS): 2 | | | |
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| 6. Preliminary conditions (max. 3): Analysis in Several Variables lecture + seminar | | | | | |
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| 7. Announced:fall semester, spring semester, both | | | | | |
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| 8. Limit for participants: 40 | | | | | |
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| 10. Responsible teacher (faculty, institute and department):  Margit Pap PhD (Faculty of Science, Institute of Mathematics and Informatics, Department of Mathematics) | | | | | |
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| 11. Teacher(s) and percentage: | | Dr. Margit Pap | | 100 % | |
| Dr. Tímea Eisner | | 100 % | |
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| 12. Language:English | | | | | |
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| 13. Course objectives and/or learning outcomes:  **Objectives**: The lecture intends to introduce students to the the concepts of line integral and the elements of complex analysis: complex derivative, complex integral, holomorphic functions, integral formulas of Cauchy and applications. The course helps the development of problem solving skills.  Learning outcomes: students completing the course will have *knowledge* on basic concepts and theorems of Multivariable Analysis. They will be *able* to apply the properties of these concepts. They will have a *competence* of evaluating readings in Analysis. Their positive *attitude* towards methods calculating limits will increase significantly. | | | | | |
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| 14. Course outline   1. Line integral. Definition of smooth paths, piecewise smooth curves, properties. Definition of line integral of continuous function on a piecewise smooth curve. Properties of line integral. 2. Primitive/Potential function. Newton-Leibniz formula and corollaries. Applications of line integrals. 3. Sufficient conditions for the existence of primitive function: the equality of partial derivatives on simply connected regions. Path-independence of the line integral. Generalisations for 3 dimensions. 4. Algebra and analytic geometry of complex numbers, the Riemann sphere. Sequences, series, power series and their convergence. 5. Continuity, differentiability and integrability of complex functions of real variable. 6. Complex functions of complex variable. Holomorphic functions. Derivatives of complex functions. Cauchy-Riemann equalities. 7. Necessary and sufficient conditions of differentiability. 8. Complex power series. Complex extension and properties of elementary functions. 9. Complex integral and its connection to the line integral. 10. Cauchy's integral theorem. Corollaries. 11. Riemann generalization of Cauchy's integral theorem and Cauchy's integral formula. 12. Expansion of holomorphic functions into power series. Generalized Cauchy integral formula. Laurent series. 13. Cauchy's estimate, Maximum Modulus Principle. Liouville's Theorem. Fundamental Theorem of Algebra. | | | | | |
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| 15. Mid-semester works  Attending lectures is compulsory. | | | | | |
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| 16. Course requirements and grading  Written exam is based on lectures, accessible electronic sources and lecture materials.  There is a written preliminary exam. Preliminary exam grades:  0–54% fail  55–69% acceptable  70–79% average  80–89% good  90–100% excellent  After successful preliminary exam there is an oral exam in 3 topics. The final grade is obtained from the arithmetic mean of the 4 grades, but only in case when all parts hit the acceptable measure. | | | | | |
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| 17. List of readings  L. Ahlfors, Complex analysis, McGraw-Hill, New York, 1979.  Rudin, Walter. Real and complex analysis. Tata McGraw-Hill Education, 1987.  Stein, Elias M., and Rami Shakarchi. Princeton Lecture in Analysis II. Complex Analysis. 2003. | | | | | |
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| 18. Recommended texts, further readings | | | | | |
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| **Date** | 14 May, 2017 | **Prepared by** |  | | |
| **Dr. Margit PAP** responsible teacher | | |
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| **Endorsed by** | | |  | | |
| Dr. László TÓTH program supervisor | | |