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| 1. Course title: Complex series 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): 3 | | | |
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| 6. Preliminary conditions (max. 3): Analysis 1 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 solutions of differential equations and investigation of real and complex series. The course helps the development of problem solving skills.  Learning outcomes: students completing the course will have *knowledge* on basic concepts and theorems of Mathematical Analysis. They will be *able* to apply the properties of these concepts. They will have a *competence* of evaluating readings in Analysis 2. Their positive *attitude* towards methods calculating limits will increase significantly. | | | | | |
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| 14. Course outline   1. Differential equations. Separable differential equations. Differential equations reduced to separable ones. 2. First order linear differential equations. Bernoulli differential equations. 3. Incomplete second order differential equations, second order linear differential equations. 4. Second order linear differential equations with constant coefficients. 5. Definition of real and complex series, definition of convergence. Absolute convergence. Cauchy criteria for series. Some highlighted series: harmonic series, geometric series, series of positive terms. Test of comparison. 6. Leibniz-type series. Examples for convergent but not absolute convergent series. Operations with series 1. (sum, constant multiple, changing parenthesis) 7. Convergence criterions/tests: Cauchy’s root test, D’Alambert’s fraction test. Integral criterion. 8. Operations with series 2: reordering of series. The theorem on reordering of absolute convergent series. Riemann theorem. Condensation principle of Cauchy. Applications. 9. Operations with series 3: Cauchy product of series, rectangle product. 10. Complex Power series. Cauchy-Hadamard theorem and corollaries. Definition of limit function of a function series. Operations. Changing to a power series of other center of convergence. Continuity, differentiability, integrability of limit function of power series. 11. Taylor series. Decomposition of functions as limit functions of Taylor series. Taylor formula. 12. Taylor series of some elementary functions (exp, sin cos, sinh, cosh). Extension of some elementary functions to the complex plane. Properties (parity, Euler formulas, function equations, addition formulas.) Properties of complex elementary functions, their real constrictions and properties. 13. Function sequences and series. (Definition, convergence, uniform convergence. Inheritance of function properties.) | | | | | |
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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:  0–55% fail  56–70% acceptable  71–80% average  81–90% good  91–100% 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  Rudin, Walter. Principles of mathematical analysis. Vol. 3. New York: McGraw-Hill, 1964.  Stewart, James. Calculus: early transcendentals. Cengage Learning, 2015.  Stroyan, K. D. "A brief introduction to infinitesimal calculus." University of Iowa (2004).  Lang, Serge. Undergraduate analysis. Springer Science & Business Media, 2013. | | | | | |
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| 18. Recommended texts, further readings  Joel R. Hass, Christopher D. Heil, Maurice D. Weir. Thomas' Calculus, 14th Edition. | | | | | |
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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 | | |