|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1. Course title: Finite mathematics 1 | | | | | | |
|  | | | | | | |
| 2. Code: | | | 3. Type (lecture, practice etc.): lecture | | | |
|  | | | | | | |
| 4. Contact hours: 2 hoursper week | | | 5. Number of credits (ECTS): 2 | | | |
|  | | | | | | |
| 6. Preliminary conditions (max. 3): - | | | | | | |
|  | | | | | | |
| 7. Announced:fall semester, spring semester, both | | | | | | |
|  | | | | | | |
| 8. Limit for participants: - | | | | | | |
|  | | | | | | |
| 10. Responsible teacher (faculty, institute and department):  Péter Csorba PhD (Faculty of Science, Institute of Mathematics and Informatics, Department of Mathematics) | | | | | | |
|  | | | | | | |
| 11. Teacher(s) and percentage: | | | Dr. Péter CSORBA | | | 100 % |
|  | | | | | | |
| 12. Language:English | | | | | | |
|  | | | | | | |
| 13. Course objectives and/or learning outcomes:  Objectives: The lecture intends to introduce students the basic theorems of combinatorics and graph theory.  Learning outcomes: Students completing the course will have basic *knowledge* on combinatorics and graph theory, and they will be *able* use this knowledge. | | | | | | |
|  | | | | | | |
| 14. Course outline   1. Recursion, Fibonacci numbers, golden ratio, explicit formula 2. Basic counting strategies (independent decisions, disjoint cases, all-bad, double counting, counting two ways the same, recursion). Permutations, variations, combinations with and without repetition. 3. Pigeon hole principle, applications. Binomial coefficients, identities. Binomial, multinomial theorem 4. Pascal's triangle, 3 ways, identities 5. 21 questions, adaptive and non-adaptive version 6. Principle of inclusion and exclusion, applications 7. Dyck paths, Catalan numbers 8. Graphs, isomorphism, subgraphs. Walk, path, cycle, connectivity, components 9. Tree, forest, Prüfer-code, Cayley's theorem 10. Degree sequence, realization with loops and parallel edges, with simple graphs 11. Chromatic number, click, bipartite graphs, Mycielski construction. Theorem of Brooks and Vizing, edge chromatic number 12. Euler trail/circuit, Hamiltonian path/cycle, theorem of Dirac and Ore 13. Planar graphs, Euler formula, 5 color theorem, Kuratowski's theorem | | | | | | |
|  | | | | | | |
| 15. Mid-semester works  Attending all lectures is highly recommended. | | | | | | |
|  | | | | | | |
| 16. Course requirements and grading  Oral exam: student gets 2 theoretical questions and one exercise to solve. | | | | | | |
|  | | | | | | |
| 17. List of readings | | | | | | |
|  | | | | | | |
| 18. Recommended texts, further readings   1. L. Lovász, J. Pelikán, K. Vesztergombi, Discrete Mathematics: Elementary and Beyond, Springer, 2003 2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th edition, McGraw-Hill, 2012 | | | | | | |
|  | | | | | | |
| **Date** | 13 April, 2017 | **Prepared by** | |  | | |
| Dr. Péter CSORBA  responsible teacher | | |
|  | | | | | | |
| **Endorsed by** | | | | |  | |
| Dr. László TÓTH program supervisor | |