MATH 233 Discrete Mathematics

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Course Description

The course aims to provide students with the mathematical infrastructure to solve problems involving logic, set theory, properties of the whole numbers, combinatorics (with elementary intuitive probability), trees and graphs.

There will be time available for the investigation of subjects related to students' engineering specialities, if there is demand for this.

Prerequisites

None.

Course Information

Course web site `http://learn.bilgi.edu.tr`

Credits 3

ECTS Credit(s) 5

Term Fall

Instructor Information

Lecturer Chris Stephenson

Learning Outcomes

On successful completion of this course, a student will be able to

- Use the basic terminology and methods of discrete mathematics.
- State problems in engineering as discrete mathematics problem and solve them.
- Interpret the solutions obtained by methods of discrete mathematics (mathematically and practically).
- Construct proofs for all the topics covered in the course using proof techniques such as mathematical induction, contradiction, counter example and construction.
- Manipulate expressions in propositional logic and first order predicate logic. Perform simple proofs of equivalence of propositional logic sentences. Apply logic to real world problems.
- Apply modular arithmetic and arithmetic based in different number bases to games and puzzles
- Perform simple combinatorial and combinatorial probabilistic calculations. Prove the binomial theorem and results derived from it
- Construct and solve recurrence relations.

- Formulate and prove theorems in simple number theory, including proofs about prime numbers, greatest common divisors and other proofs about divisibility. Prove Fermat's Little Theorem and results derived from it.
- Express real life problems in the language of graph theory and solve them.

Textbook

Course textbook:

- L. Lovasz, K. Vesztergombi, Discrete Mathematics Lecture Notes, Yale University. `https://www.cims.nyu.edu/~regev/teaching/discrete_math_fall_2005/dmbook.pdf`

Supplementary books:

- Ralph P. Grimaldi, Discrete and Combinatorial Mathematics.
- K. H. Rosen, Discrete Mathematics and Its Applications 6th edition.

Evaluation

- Coursework (attendance, quizzes, assignments) 20%
- Mid term examination 30%
- Final examination 50%
- Bonus points may be awarded for participation in class and in the on-line self help forum.

There will be scope for students who wish to follow a project based approach to gain project based grades. This must be agreed with the lecturer as for an individual study plan.

Course policies

- Late assignments are not accepted. Not ever.
- Any form of plagiarism or attempted plagiarism will result in immediate failure from the course. This includes copying in quizzes and exams and copying any part of an assignment from another student or from an external source, such as a book or web site and signing the attendance sheet for another student or inviting another student to sign for you.
- There is no attendance requirement. However, students will not be able to gain pop quiz grades, participation grades and interactively evaluated assignment grades without attending the lectures and classes. The only exception will be for students with an agreed individual study plan.
- In lectures and in classes students who arrive late or leave early should not sign the attendance sheet. It is not expected that students will arrive late without good reason or leave early without permission. Early leavers who have already signed should delete their names from the attendance sheet. Late means after teaching or other in class activity has begun. Early means before teaching or other in class activity has ended.
- Every student must print out and sign the last page of this syllabus and hand it to the assistants with your name and student number. You must also write "I understand" in your own handwriting under your signature to show that you have read the whole of the syllabus. Your work will not be graded if you have not completed this requirement.
- A student who wishes to study this course in a different way from that proposed by the lecturer may agree an individual study plan with the lecturer. This must be done by the end of the second week of term.

Lecture sequence

Weekly plan. This plan is approximate and will change in accordance with students' needs

1. Review of basic notions for sets, relations and functions
2. The basic counting principles, examples and typical questions
3. Permutations and combinations and combinations with repetitions
4. Induction and the Pigeonhole principle
5. The binomial coefficients, the binomial theorem and Pascal's triangle
6. Fibonacci numbers, recurrence relations and their solutions
7. Combinatorial probability
8. Integers, divisors and primes; division and Euclidean Algorithms and their applications
9. Prime numbers, Fermat's Little Theorem, application to cryptography. Random methods.
10. Introduction to graphs
11. Euler and Hamilton paths and shortest-path problems.
12. Graphs and trees

Signature - Syllabus - Math 233

Given Name and Family Name: .....

Student ID: .....

Signature .....