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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | **ECTS Course Description Form** | | | | | | | | | | | | | | | | |
|  | **PART I ( Senate Approval)** | | | | | | | | | | | | | | | | | | | | |
|  | **Offering School** | **Engineering** | | | | | | | | | | | | | | | | | | | |
|  | **Offering Department** | **Computer Engineering** | | | | | | | | | | | | | | | | | | | |
|  | **Program(s) Offered to** | **Computer Engineering** | | | | | | | | | | | **Compulsory** | | | | | | | | |
|  |  | | | | | | | | | | |  | | | | | | | | |
|  |  | | | | | | | | | | |  | | | | | | | | |
|  | **Course Code** | **CS213** | | | | | | | | | | | | | | | | | | | |
|  | **Course Name** | **Discrete Computational Structures** | | | | | | | | | | | | | | | | | | | |
|  | **Language of Instruction** | **English** | | | | | | | | | | | | | | | | | | | |
|  | **Type of Course** | **Compulsory** | | | | | | | | | | | | | | | | | | | |
|  | **Level of Course** | **Undergraduate** | | | | | | | | | | | | | | | | | | | |
|  | **Hours per Week** | **Lecture: 3** | | | | **Laboratory:** | | | **Recitation:** | | **Practical:** | | | | **Studio:** | | | **Other:** | | | |
|  | **ECTS Credit** | **6** | | | | | | | | | | | | | | | | | | | |
|  | **Grading Mode** | **Letter Grade** | | | | | | | | | | | | | | | | | | | |
|  | **Pre-requisites** |  | | | | | | | | | | | | | | | | | | | |
|  | **Co-requisites** |  | | | | | | | | | | | | | | | | | | | |
|  | **Registration Restriction** |  | | | | | | | | | | | | | | | | | | | |
|  | **Educational Objective** | **The main objective of this course is to provide the students with a knowledge on theoretical foundations of problem solving and experience in working with discrete computational structures common in computer science and computational problems.** | | | | | | | | | | | | | | | | | | | |
|  | **Course Description** | **Introduction to the main concepts of discrete computational structures. Overview of formal tools for mathematical reasoning and proof construction. A thorough discussion of mathematical induction as a proof technique and how it relates to problem solving, algorithm design and program verification. An introduction to combinatorial analysis and its application on discrete structures including sets, permutations, graphs, and trees.** | | | | | | | | | | | | | | | | | | | |
|  | **Learning Outcomes** | **LO1: Interpret main principles of formal mathematical reasoning as applied to computational structures** | | | | | | | | | | | | | | | | | | |  |
|  | **LO2: Prove claims on discrete structures** | | | | | | | | | | | | | | | | | | |
|  | **LO3: Employ mathematical induction, a fundamental proof technique, on discrete structures** | | | | | | | | | | | | | | | | | | |
|  | **LO4: Apply induction to design algorithmic solutions to combinatorial problems** | | | | | | | | | | | | | | | | | | |
|  | **LO5: Apply code verification using the proof techniques learned in class** | | | | | | | | | | | | | | | | | | |
|  | **LO6: Analyse discrete structures common in computer science and engineering such as sets, permutations, graphs, and trees and apply the proof/analysis techniques on such structures** | | | | | | | | | | | | | | | | | | |
|  | **PART II ( Faculty Board Approval)** | | | | | | | | | | | | | | | | | | | | |
|  | **Basic Outcomes (University-wide)** | | **No.** | **Program Outcomes** | | | | | | | | **LO1** | | **LO2** | | **LO3** | **LO4** | | **LO5** | **LO6** | |
|  | **PO1** | **Ability** to communicate effectively and write and present a report in Turkish and English. | | | | | | | | *0 3 0 0 0 0*  *1 1 1 1 1 1*    ***1 1 1 1 1 1***  ***0 0 0 0 0 0***  ***0 0 0 0 0 0***  ***0 0 0 0 0 0***  ***2 1 1 2 2 2***  ***0 0 0 0 0 0***  ***2 1 1 3 3 3***  ***0 0 0 0 0 0***  ***3 3 3 3 3 3***  ***1 0 0 0 2 0***  ***1 0 0 0 2 0*** | | | | | | | | | |
|  | **PO2** | **Ability** to work individually, and in intra-disciplinary and multi-disciplinary teams. | | | | | | | |
|  | **PO3** | **Recognition** of the need for life-long learning and **ability** to access information, follow developments in science and technology, and continually reinvent oneself. | | | | | | | |
|  | **PO4** | **Knowledge** of project management, risk management, innovation and change management, entrepreneurship, and sustainable development. | | | | | | | |
|  | **PO5** | **Awareness** of sectors and **ability** to prepare a business plan. | | | | | | | |
|  | **PO6** | **Understanding** of professional and ethical responsibility and **demonstrating** ethical behaviour. | | | | | | | |
|  | **Faculty/ Program Specific Outcomes** | | **PO7** | **Ability** to define complex engineering  problems, develop models and  implement solutions for these  problems | | | | | | | |
|  | **PO8** | **Ability** to conduct lab experiments by using  computers and the ability of collecting, analysing and interpreting data. | | | | | | | |
|  | **PO9** | **Ability** to apply the knowledge of  mathematics, science and engineering  principles to solve problems in computer  engineering. | | | | | | | |
|  | **PO10** | An **understanding** of current contemporary  issues and impact of engineering solutions  in legal and ethical levels | | | | | | | |
|  | **PO11** | **Ability** to understand and apply discrete  mathematics concepts. | | | | | | | |
|  | **PO12** | **Ability** to use modern engineering  techniques, tools and information  technologies and develop software  equipment and software. | | | | | | | |
|  | **PO13** | **Ability** to analyse, design and manage the  hardware/software computer system  requirements with limited resources and  conditions by modern engineering  principles. | | | | | | | |
| **PART III (Department Board Approval)** | | | | | | | | | | | | | | | | | | | | | |
| **Course Subjects, Contribution of Course Subjects to Learning Outcomes, and Methods for Assessing Learning of Course Subjects** | | | **Subjects** | **Week** | | |  | | | | | **LO1** | | **LO2** | | **LO3** | **LO4** | | **LO5** | **LO6** | |
| **S1** | 1 | | | An introduction to Propositional Logic | | | | | A1/3 | |  | |  |  | |  |  | |
| **S2** | 2 | | | Operations in propositional logic and equivalences | | | | | A1/3 | |  | |  |  | |  |  | |
| **S3** | 3 | | | Predicate logic and quantifiers | | | | | A1/3 | |  | |  |  | |  |  | |
| **S4** | 4 | | | Rules of inference and an introduction to proofs | | | | | A1/3 | | A1/3 | |  |  | |  |  | |
| **S5** | 5 | | | Proof methods and strategy | | | | | A1/3 | | A1/3 | |  |  | |  |  | |
| **S6** | 6 | | | Employing proof methods and strategy to prove structural combinatorics properties regarding sets, sequences etc. | | | | | A1/3 | | A1/3 | |  |  | |  |  | |
| **S7** | 7 | | | An introduction to mathematical  induction | | | | |  | | A1/3 | | A1/3 |  | |  |  | |
| **S8** | 8 | | | Using induction as a proof technique | | | | |  | | A1/3 | | A1/3 |  | |  |  | |
| **S9** | 9 | | | More examples of use of induction. Employing induction to prove claims regarding sets, sequences, permutations, etc. | | | | |  | | A1/3 | | A1/3 |  | |  |  | |
| **S10** | 10 | | | The relationship between induction and the recursive algorithms | | | | |  | | A1/3 | |  | A1/3 | | A1/3 |  | |
| **S11** | 11 | | | Induction as an algorithm design  method and a program verification  technique | | | | |  | | A1/3 | |  | A1/3 | | A1/3 |  | |
| **S12** | 12 | | | Counting, Pigeonhole principle, recurrence relations and solving  recurrences | | | | |  | |  | | A1/3 | A1/3 | |  |  | |
| **S13** | 13 | | | Problem solving via setting up  recurrence relations and its relationship to mathematical induction | | | | |  | |  | | A1/3 | A1/3 | |  |  | |
| **S14** | 14 | | | An introduction to graphs and trees,  and proving some properties of trees | | | | |  | | A1/3 | |  |  | |  | A1/3 | |
| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules** | | | **No.** | **Type** | | | | **Weight** | | **Implementation Rule** | | | | **Make-Up Rule** | | | | | | | |
| **A1** | **Exam** | | | | *80* | | *There are 2 midterms*  *exams and 1 final exam for the course. Each midterm’s weight is 20 and the final exam’s weight is 40. Exam dates will be shown on the tentative schedule and it can be changed according to the course schedule.* | | | | If a student misses an exam and  provides an acceptable legitimate  document, a make-up exam will be  provided. | | | | | | | |
| **A2** | **Quiz** | | | |  | |  | | | |  | | | | | | | |
| **A3** | **Homework** | | | | *20* | | *There are 2 homework, each with weight 10, for the course. Each student*  *should prepare his/her homework by himself, herself. Submissions should be neatly presented.* | | | | There will be no make-up for the  homework. | | | | | | | |
| **A4** | **Project** | | | |  | |  | | | |  | | | | | | | |
| **A5** | **Report** | | | |  | |  | | | |  | | | | | | | |
| **A6** | **Presentation** | | | |  | |  | | | |  | | | | | | | |
| **A7** | **Attendance/ Interaction** | | | |  | |  | | | |  | | | | | | | |
| **A8** | **Class/Lab./**  **Field Work** | | | |  | |  | | | |  | | | | | | | |
| **A9** | **Other** | | | |  | |  | | | |  | | | | | | | |
| **TOTAL** | | | | | **100%** | | | | | | | | | | | | | |
| **Evidence of Achievement of Learning Outcomes** | | | Students will demonstrate learning outcomes through midterm exams, homework assignments, and the  final exam. Every topic is tested with at least one exam or homework question. In order to pass, a student  needs to accumulate certain percentage of points and this percentage is determined by the class mean. | | | | | | | | | | | | | | | | | | |
| **Method for Determining Letter Grade** | | | The method on which the letter grade is based on will be announced at the beginning of the semester, and  this method may be subjected to change depending on the performance of the students. 2 midterms, 2  homework assignments, and the final exam are used for grading. Letter grades are tentatively determined  using the table below. Here “-x” means (average-3-x) and “+x” means (average+3+x), and each denotes  the minimum points necessary for the corresponding letter grade.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Total points** | +25 | +20 | +15 | +10 | +5 | Class Average ± 3 | -5 | -10 | -15 | -20 | | **Letter Grade** | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | | | | | | | | | | | | | | | | | | | |
| **Teaching Methods, Student Work Load** | | | **No** | **Method** | | | | **Explanation** | | | | | | | | | | **Hours** | | | |
| ***Time applied by instructor*** | | | | | | | | | | | | | | | | | | |
| **1** | **Lecture** | | | | Lecturing and utilizing white board. Sample questions and answers to strengthen learning. In class exams. | | | | | | | | | | 3x14=42 | | | |
| **2** | **Interactive Lecture** | | | |  | | | | | | | | | |  | | | |
| **3** | **Recitation** | | | |  | | | | | | | | | |  | | | |
| **4** | **Laboratory** | | | |  | | | | | | | | | |  | | | |
| **5** | **Practical** | | | |  | | | | | | | | | |  | | | |
| **6** | **Field Work** | | | |  | | | | | | | | | |  | | | |
| ***Time expected to be allocated by student*** | | | | | | | | | | | | | | | | | | |
| **7** | **Project** | | | |  | | | | | | | | | |  | | | |
| **8** | **Homework** | | | | Answers of given questions are prepared at home | | | | | | | | | | 2x8=16 | | | |
| **9** | **Pre-class Learning of Course Material** | | | | New subjects are learned by watching videos or reading course  notes before class. | | | | | | | | | | 6x14=84 | | | |
| **10** | **Review of Course Material** | | | | Review of the subjects before exams in order to prepare. | | | | | | | | | | 24 | | | |
| **11** | **Studio** | | | |  | | | | | | | | | |  | | | |
| **12** | **Office Hour** | | | | One office hour per week is allocated for students’ questions | | | | | | | | | | 14 | | | |
| **TOTAL** | | | | | 180 | | | | | | | | | | | | | |
| **IV. PART** | | | | | | | | | | | | | | | | | | | | | |
| **Instructor** | | | **Name** | | | | | Cesim Erten | | | | | | | | | | | | | |
| **E-mail** | | | | | Cesim.erten@antalya.edu.tr | | | | | | | | | | | | | |
| **Phone Number** | | | | | *+90-242-2450000* | | | | | | | | | | | | | |
| **Office Number** | | | | | *A1-28* | | | | | | | | | | | | | |
| **Office Hours** | | | | | *TBA* | | | | | | | | | | | | | |
| **Course Materials** | | | **Mandatory** | | | | | *DISCRETE MATHEMATICS AND ITS APPLICATIONS, KENNETH H.*  *ROSEN, MCGRAW HİLL, 6 TH EDİTİON, 2007.* | | | | | | | | | | | | | |
| **Recommended** | | | | | *DISCRETE MATHEMATICS WİTH APPLICATIONS, SUSANNA S. EPP,*  *BROOKS COLE, 3 RD EDİTİON, 2003.* | | | | | | | | | | | | | |
| **Other** | | | **Scholastic Honesty** | | | | | Violations of scholastic honesty include, but are not limited to cheating, plagiarizing,  fabricating information or citations, facilitating acts of dishonesty by others, having  unauthorized possession of examinations, submitting work of another person or work  previously used without informing the instructor, or tampering with the academic work  of other students. Any for of scholastic dishonesty is a serious academic violation and  will result in a disciplinary action. | | | | | | | | | | | | | |
| **Students with Disabilities** | | | | | Reasonable accommodations will be made for students with verifiable disabilities. | | | | | | | | | | | | | |
| **Safety Issues** | | | | |  | | | | | | | | | | | | | |
| **Flexibility** | | | | | Circumstances may arise during the course that prevents the instructor from fulfilling  each and every component of this syllabus; therefore, the syllabus is subject to change.  Students will be notified prior to any changes. | | | | | | | | | | | | | |