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|----------------|--|-----------------|--|
| <b>Faculty</b> | <b>Faculty of Engineering</b>                      |                 |  |
| <b>Program</b> | <b>B.Sc. in Civil Engineering</b>                  | <b>Elective</b> |  |
|                | <b>B.Sc. in Computer Engineering</b>               | <b>Required</b> |  |
|                | <b>B.Sc. in Electrical-Electronics Engineering</b> | <b>Elective</b> |  |
|                | <b>B.Sc. in Industrial Engineering</b>             | <b>Elective</b> |  |
|                | <b>B.Sc. in Mechanical Engineering</b>             | <b>Elective</b> |  |

|   |  |                   |                    |                   |
|---|--|-------------------|--------------------|-------------------|
| <b>Course Code</b>                              | MATH 321   |                   |                    |                   |
| <b>Course Title in English</b>                  | Automata Theory and Formal Languages   |                   |                    |                   |
| <b>Course Title in Turkish</b>                  | Biçimsel Diller ve Otomatlar Kuramı  |                   |                    |                   |
| <b>Language of Instruction</b>                  | English  |                   |                    |                   |
| <b>Type of Course</b>                           | Flipped Classroom  |                   |                    |                   |
| <b>Level of Course</b>                          | Undergraduate, Introductory  |                   |                    |                   |
| <b>Course Category (by % of Content)</b>        | Basic Science  | Basic Engineering | Engineering Design | General Education |
|   | 100  | -                 | -                  | -                 |
| <b>Semester Offered</b>                         | Fall   |                   |                    |                   |
| <b>Contact Hours per Week</b>                   | Lecture: 3 hours   | Recitation: -     | Lab: -             | Other: -          |
| <b>Estimated Student Workload</b>               | 160 hours  |                   |                    |                   |
| <b>Number of Credits</b>                        | 6 ECTS   |                   |                    |                   |
| <b>Grading Mode</b>                             | Standard Letter Grade  |                   |                    |                   |
| <b>Pre-requisites</b>                           | None   |                   |                    |                   |
| <b>Expected Prior Knowledge</b>                 | Basic Discrete Mathematics and Data Structures Knowledge   |                   |                    |                   |
| <b>Co-requisites</b>                            | None   |                   |                    |                   |
| <b>Registration Restrictions</b>                | Only Undergraduate Students  |                   |                    |                   |
| <b>Overall Educational Objective</b>            | To learn the fundamentals of theory of computation, basic graph theory and introductory discrete mathematics, learn the classification between classes of languages (regular, context-free, and more) and design grammars and machines that will generate/recognize these languages.   |                   |                    |                   |
| <b>Course Description</b>                       | This course covers the fundamentals of theory of computation: basic graph theory, introductory discrete mathematics, regular languages, finite state machines, push-down automata, regular expressions, context-free grammars, Turing machines, decidability, reducibility, time complexity  |                   |                    |                   |
| <b>Course Description in Turkish</b>            | Bu derste, biçimsel diller ve otomatlar kuramının temel kavramları şu başlıklar altında işlenmektedir: temel çizge teorisi, sonlu küme matematiğine giriş, düzenli diller, sonlu durum makineleri, ters otomat, düzenli ifadeler, bağlama duyarsız gramerler, Turing makineleri, karar verilebilirlik, indirgenebilirlik, zaman karmaşıklığı.  |                   |                    |                   |
| <b>Course Learning Outcomes and Competences</b> | Upon successful completion of the course, the learner is expected to: <ol style="list-style-type: none"> <li>1. know basic discrete mathematics and graph theory;</li> <li>2. identify finite state machines, regular languages, regular expressions, determinism and nondeterminism and their connection;</li> <li>3. know context-free languages, push-down automata and their connection;</li> <li>4. comprehend Turing machines, decidability and reducibility;</li> <li>5. apply new knowledge as needed, using appropriate learning strategies.</li> </ol> |                   |                    |                   |

| Relationship of the Course with the Student Outcomes   | Level  | Learning Outcome(s)  | Assessed by   |
|--|--|--|---|
| <b>Student Outcomes</b>  | N=None<br>S=Supportive<br>H=High                                   |  | Exam,<br>Project, HW,<br>Experiment,<br>Presentation,<br>etc. |
| (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics  | H  | 1,2,3,4  | Exam, HW,<br>Quiz   |
| (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors                   |  |  |   |
| (3) an ability to communicate effectively with a range of audiences  |  |  |   |
| (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts |  |  |   |
| (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives   |  |  |   |
| (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions  |  |  |   |
| (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies   | S  | 5  | HW  |
| <b>Prepared by and Date</b>  | Asst. Prof. Dr. Şeniz Demir / June 2019                            |  |   |
| <b>Semester</b>  | Fall 2019-2020   |  |   |
| <b>Name of Instructor</b>  | Asst. Prof. Dr. Şeniz Demir  |  |   |
| <b>Course Contents</b>   | Week   | Topic  |   |
|  | 1.   | Basic Discrete Mathematics and Graph Theory                  |   |
|  | 2.   | Basic Discrete Mathematics and Graph Theory                  |   |
|  | 3.   | Finite State Machines and Regular Languages                  |   |
|  | 4.   | Finite State Machines and Regular Languages                  |   |
|  | 5.   | Nondeterminism and Regular Expressions                       |   |
|  | 6.   | Equivalence of Regular Expressions and Finite State Machines |   |
|  | 7.   | Nonregular Languages and Pumping Lemma                       |   |
|  | 8.   | Nonregular Languages and Pumping Lemma                       |   |
|  | 9.   | Context-Free Grammars and Ambiguity                          |   |
|  | 10.  | Push-Down Automata   |   |
|  | 11.  | Non-Context-Free Languages and Pumping Lemma                 |   |
|  | 12.  | Turing Machines  |   |
|  | 13.  | Turing Machines  |   |
|  | 14.  | Advanced Topics (Decidability, reducibility)                 |   |
|  | 15.  | Final Exam/Project/Presentation                              |   |
|  | 16.  | Final Exam/Project/Presentation                              |   |
| <b>Required/Recommended Readings</b>   | Introduction To The Theory Of Computation – Michael Sipser 3rd ed. |  |   |
| <b>Teaching Methods</b>  | Flipped classroom. Students work individually for homework.        |  |   |
| <b>Homework and Projects</b>   | Homework. No Project.  |  |   |
| <b>Laboratory Work</b>   | None   |  |   |
| <b>Computer Use</b>  | For Programming  |  |   |
| <b>Other Activities</b>  | None   |  |   |
| <b>Assessment Methods</b>  | Quizzes (10%), Homework (10%), 2 Midterms (40% each)               |  |   |

**Course Administration**

Dr. Şeniz Demir

**E-mail:** demirse@mef.edu.tr**Rules for attendance:** No attendance required.**Missing a quiz:** Provided that proper documents of excuse are presented, each missed quiz by the student will be given a grade which is equal to the average of all of the other quizzes. No make-up will be given.**Missing a homework:** On late submissions, first day -10 points, second day -30 points, and third day -50 points deduction of the earned grade. No grade will be given to submissions after the third day.**Missing a midterm:** Provided that proper documents of excuse are presented, make-up for missed midterms will be given.**Missing a final:** YÖK Regulations.**A reminder of proper classroom behavior, code of student conduct:** YÖK Regulations**Statement on plagiarism:** YÖK Regulations**ECTS Student Workload Estimation**

| Activity                  | No/Weeks | Hours                          |                                  |  | Calculation | Explanation |
|---------------------------|----------|--------------------------------|----------------------------------|--|-------------|-------------|
|                           |          | Preparing for the Activity (B) | Spent in the Activity Itself (C) | Completing the Activity Requirements (D) |             |             |
| Lecture/Flipped Classroom | 14       | 2                              | 3                                | 0  | 70          | A*(B+C+D)   |
| Quizzes                   | 4        | 2                              | 1                                | 0  | 12          |             |
| Midterm(s)                | 2        | 28                             | 6                                | 0  | 68          | A*(B+C+D)   |
| Homeworks                 | 2        | 2                              | 3                                | 0  | 10          | A*(B+C+D)   |
| Final Examination         |          |                                |                                  |  |             | A*(B+C+D)   |
| Total Workload            |          |                                |                                  |  | 160         |             |
| Total Workload/25         |          |                                |                                  |  | 6.4         |             |
| ECTS                      |          |                                |                                  |  | <b>6</b>    |             |