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|  | **ECTS Course Description Form** |
| **PART I ( Senate Approval)** |
| **Offering School**  | **Engineering** |
| **Offering Department** | **Electrical and Electronics Engineering** |
| **Program(s) Offered to** | **Electrical and Electronics Engineering** | **Compulsory** |
| **Computer Engineering** | **Elective** |
| **Industrial Engineering** | **Elective** |
| **Course Code**  | **EE 331** |
| **Course Name** | **Signals and Systems** |
| **Language of Instruction** | **English** |
| **Type of Course** | *Course* |
| **Level of Course** | **Undergraduate** |
| **Hours per Week** | **Lecture: 3** | **Laboratory:**  | **Recitation:**  | **Practical: 1**  | **Studio:** | **Other:** |
| **ECTS Credit** | **7** |
| **Grading Mode** | **Letter Grade** |
| **Pre-requisites** | *The successful completion of MATH 102 Mathematics II, CS 101 Introduction to Programming I and CS 102 Introduction to Programming II courses is prerequisite for taking EE 331 Signals and Systems* |
| **Co-requisites** | *-* |
| **Registration Restriction** | *-* |
| **Educational Objective** | This course aims to introduce fundamental techniques for analyzing and synthesizing continuous-time and discrete-time signals and systems. Students will learn to use mathematical tools for representing signals and systems both in time and frequency domains. They will also learn filtering and sampling for both analog and digital systems. |
| **Course description** | This course covers the basics of signals and systems: introduction to processing, analysis and synthesis of continuous and discrete time signals. Propertıes of systems. Signal representations in time and frequency domains. Linear time-invariant (LTI) systems, convolution and impulse response. Fourier analysis, spectral response of LTI systems. Sampling and filtering. Laplace-transform and Z-transform. |
| **Learning Outcomes** | **LO1** | Analyze discrete-time and continuous-time signals and systems |
| **LO2** | Analyze signals and systems using the Fourier series |
| **LO3** | Apply Fourier transform and Fourier analysis to LTI systems |
| **LO4** | Apply sampling and filtering |
| **LO5** | Apply Laplace transform and Z-transform to LTI systems |
| **LO6** | Implement Fourier series approximation and Fourier transform in MATLAB |
| **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.  | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **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 behavior. | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **Faculty Specific Outcomes** | **PO7** | **Ability to develop, select and use modern techniques and tools necessary for engineering applications and ability to use information technologies effectively.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO8** | **Recognition of the effects of engineering applications on health, environment and safety in the universal and societal dimensions and the problems of the time and awareness of the legal consequences of engineering solutions.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO9** | **Ability to identify, define, formulate and solve complex engineering problems; and electing and applying appropriate analysis and modelling methods for this purpose.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **Discipline Specific Outcomes (program)** | **PO10** | **Gains comprehensive knowledge in mathematics, natural sciences, related engineering fields and general engineering subjects.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO11** | **Able to identify complex engineering problems and solve them with appropriate methods of analysis.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO12** | **Able to design a complex electronic system that meets the desired performance by using modern design techniques and taking real life conditions into account.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO13** | **Able to develop new techniques and tools for solution of current engineering problems.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO14** | **Able to use computer software and hardware technologies together with information technologies in an effective way.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO15** | **Able to produce innovative solutions for solution of current engineering problems by gathering data through experiment design and interpretation of results.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO16** | **Able to actively work individually or in teams where engineers from the same or different disciplines are involved.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO17** | **Gains competency in effective written and verbal communication, presentation and preparation of technical reports in Turkish and English.**  | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO18** | **Constantly increases knowledge with the awareness of lifelong learning by closely following the developments in science and technology .** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO19** | **Acts in accordance with scientific and ethical principles and the standards used in engineering practice at every stage of career** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO20** | **Able to describe concepts related to business life such as project management, risk management, change management, entrepreneurship and sustainability.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO21** | **Gains awareness of the legal consequences of engineering solutions developed together with the effect of engineering applications on health, environment and safety on a universal and social scale.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO22** | **Able to solve problems involving probability and statistics, derivative and integral calculations, multivariable mathematics, linear algebra, differential equations, and complex variables, and their electrical and electronics applications.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO23** | **Able to organize projects and events for the social environment they live in with the awareness of social responsibility and implement them.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
| **PO24** | **Able to plan and direct activities for employees under their responsibility to develop within the framework of a project.** | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |
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| **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 | Basic signals and properties of systems | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S2** | 2 | Linear Time-Invariant Systems and convolution | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S3** | 3 | Fourier Series | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S4** | 4 | Fourier Series | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S5** | 5 | Continuous-Time Fourier Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S6** | 6 | Continuous-Time Fourier Transform  | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S7** | 7 | Discrete-Time Fourier Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S8** | 8 | Discrete-Time Fourier Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S9** | 9 | Sampling | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S10** | 10 | Filtering | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S11** | 11 | Laplace Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S12** | 12 | Laplace Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S13** | 13 | Z-Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **S14** | 14 | Z-Transform | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 | A1-A8 |
| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules**  | **No.** | **Type** | **Weight** | **Implementation Rule** | **Make-Up Rule** |
| **A1** | **Exam** | 70% | No electronic devices are allowed in the exams except calculators  | The student is informed about a make-up exam in case his/her excuse is valid and an accompanying doctor’s report is provided. |
| **A2** | **Quiz** |  |  |  |
| **A3** | **Homework** |  |  |  |
| **A4** | **Project** |  |  |  |
| **A5** | **Report** |  | - | - |
| **A6** | **Presentation** |  | - | - |
| **A7** | **Attendance/ Interaction** |  | - | - |
| **A8** | **Class/Lab./****Field Work** | 30% | MATLAB exercises related to class topics are performed by students. A report is submitted until the end of the following week. | The student is informed about a make-up lab in case his/her excuse is valid and an accompanying doctor’s report is provided. |
| **A9** | **Other** |  |  |  |
| **TOTAL** | **100%** |
| **Evidence of Achievement of Learning Outcomes** | At least one question from each subject is asked during the exams. Students are required to perform MATLAB exercises and write a report for each lab. A weighted average is calculated for each student based on the percentage of each assessment method. To pass the course, students are required to obtain a minimum score out of 100, which is announced by the instructor. This score is determined based on the class average. |
| **Method for Determining Letter Grade** | The scores of 2 exams and 3 labs are used to calculate the final score. The maximum score contribution from each assessment category is shown below.

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| --- | --- | --- | --- | --- |
| Assessment | Midterm | Final  | Lab | Total |
| Point | 30 | 40 | 30 | 100 |

The table below is used to convert the total points out of 100 to a letter grade:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Point | 100-75 | 74-70  | 69-65 | 64-60 | 59-55 | 54-50 | 49-45 | 44-40 | 39-35 | 34-30 |
| Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D |

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| **Teaching Methods, Student Work Load** | **No** | **Method** | **Explanation** | **Hours** |
| ***Time applied by instructor*** |
| **1** | **Lecture** | Class content is explained using writings on the board and computer presentations | 3x14 |
| **2** | **Interactive Lecture** |  |  |
| **3** | **Recitation** | Example questions are solved on the board | 3x6 |
| **4** | **Laboratory** | MATLAB sessions based on the class content are conducted | 4x4 |
| **5** | **Practical** |  |  |
| **6** | **Field Work** |  |  |
| ***Time expected to be allocated by student*** |
| **7** | **Project** |  |  |
| **8** | **Homework** | A report on the lab work is prepared | 8x3 |
| **9** | **Pre-class Learning of Course Material**  | Next class’ material is read before the class | 3x14 |
| **10** | **Review of Course Material** | Previous class material is reviewed each week | 3x14 |
| **11** | **Studio** |  |  |
| **12** | **Office Hour** | One-to-one meetings for discussions | 2x14 |
| **TOTAL** | *212* |
| **IV. PART** |
| **Instructor** | **Name** | Shah Rahman |
| **E-mail** | shah.rahman@antalya.edu.tr |
| **Phone Number** |  |
| **Office Number** | A1-62 |
| **Office Hours** | *Determined during each semester (1 hour per week)* |
| **Course Materials** | **Mandatory** |  |
| **Recommended** | *Signals and Systems*, Second Edition by Alan V. Oppenheim and Alan S. Willsky |
| **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 form of scholastic dishonesty is a serious academic violation and will result in disciplinary action. |
| **Students with Disabilities** | Reasonable accommodations will be made for students with verifiable disabilities. |
| **Safety Issues**  | The course does not require any special safety precautions. |
| **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.  |