# ELEC3504 COURSE CATALOG INFO

| **Course Code : ELEC3504** | | | | **Course Name :** Digital Signal Processing | | | |
|---|---|---|---|---|---|---|---|
| **Semester** | **Lecture (Le+T+L)** | **Local Credit** | **ECTS** | **Language** | **Category** | **Instructional Methods** | **Prerequisites** |
| 6 | (3+1+0) | 3 | 5 | English | Core | Lecture | ELEC2501 |
| **Course Content** | Discrete time signals. Discrete time systems and their properties. Linear time-invariant (LTI) systems and their properties. Linear Constant Coefficient Difference Equations (LCCDEqs). Frequency domain representation of the LTI systems. Discrete time Fourier tansform (DTFT). Z-transform. Sampling and reconstruction. Discrete time processing of continuous time signals. Ideal frequency selective filters. Phase distortion. Group delay. Systems characterized by LCCDEqs. All-pass systems. Minimum phase systems. Block diagram representation of the LTI systems. Signal flow graph representation. FIR filter design. Discrete Fourier series and properties. Circular convolution. Discrete Fourier Transform (DFT) and properties. Computation of DFT: Fast Fourier transform (FFT). | | | | | | |
| **Course Outcomes** | **CO 1.** Identify continuous time and discrete time signals and systems and basic system properties such as time-invariance, stability, causality, and linearity.<br>**CO 2.** Define the linear time invariant (LTI) systems described by LCCDEqs and its properties including convolution sum and convolution integral.<br>**CO 3.** Compute the z-transform of a sequence, identify its region of convergence, and compute the inverse z-transform by partial fractions.<br>**CO 4.** Evaluate the discrete-time Fourier transform (DTFT) of a sequence.<br>**CO 5.** Evaluate the discrete Fourier transform (DFT) of a sequence, relate it to the DTFT and use the DFT to compute the convolution of two sequences.<br>**CO 6.** Compute the DFT using fast Fourier transform (FFT) algorithms. | | | | | | |

| **COURSE PLAN** | |
|---|---|
| W1 | Introduction, Discrete Time Signals and Systems |
| W2 | Discrete Time Signals and Systems |
| W3 | Z-Transform, ROC, Inverse z-transform |
| W4 | Z-Transform, ROC, Inverse z-transform |
| W5 | Sampling of Continuous Time Signals |
| W6 | Transform Analysis of Linear Time Invariant Systems |
| W7 | Transform Analysis of Linear Time Invariant Systems |
| W8 | Structures for Discrete Time Systems |
| W9 | Structures for Discrete Time Systems |

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| W10 | Filter design techniques |
| W11 | The Discrete Fourier Transform |
| W12 | The Discrete Fourier Transform |
| W13 | Computation of the Discrete Fourier Transform: FFT algorithms |
| W14 | Computation of the Discrete Fourier Transform: FFT algorithms |

| COURSE ASSESMENT AND ECTS WORK LOAD | | | |
|---|---|---|---|
| **Type of Work** | **Count** | **ECTS WORK LOAD** | |
| | | **Time (Hour)(Including prep. time)** | **Work Load** |
| Attendance | 14 | 3 | 42 |
| Final Exam | 1 | 20 | 20 |
| Quizzes | | | 0 |
| Term project | | | 0 |
| Reports | | | 0 |
| Final Project | | | 0 |
| Seminar | | | 0 |
| Assignments | | | 0 |
| Presentation | | | 0 |
| Midterms | | 20 | 20 |
| Project | | | 0 |
| Laboratory | | 0 | 0 |
| Tutorial | 14 | 1 | 14 |
| Other(Self study, Paper reviews) | | 29 | 29 |
| | | **Total work load** | 125 |
| | | **Total work load/25** | 5 |

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|---|---|---|
| | **ECTS Credit** | 5 |

| **PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS** | | |
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| **PO** | **Program Outcomes** | **CO** |
| **1** | **1.1.** Adequate knowledge in fundamentals of mathematics (algebra, differential equations, integrals, probability etc), science (physics, chemistry, biology etc.) and computer science (programming and simulation); | |
| | **1.2.** ability to use theoretical and applied knowledge in these areas in complex engineering problems. | 1,..,6 |
| **2** | **2.1.** Ability to identify, formulate, and solve complex engineering problems; | 1,..,6 |
| | **2.2.** ability to select and apply proper analysis and modeling methods for this purpose. | 1,..,6 |
| **3** | **3.1.** Ability to design and integrate components of a complex system or process, as they relate to Electrical and Electronics Engineering discipline, under realistic constraints and conditions, in such a way as to meet desired requirements; | |
| | **3.2.** ability to apply modern design methods. | |
| **4** | **4.1.** Ability to devise, select, and use techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; | |
| | **4.2.** ability to employ information technologies effectively. | |
| **5** | **5.1.** Ability to design experiments, | |
| | **5.2.** ability to conduct experiments, gather, analyze and interpret data. | |
| **6** | **6.1.** Ability to work in intra-disciplinary teams; | |
| | **6.2.** ability to work in multi-disciplinary teams; | |
| | **6.3.** ability to take individual responsibilities. | |
| **7** | **7.1.** Ability to effectively communicate via written and oral means; | |
| | **7.2.** knowledge of at least one foreign language; | |
| | **7.3.** ability to write effective reports and comprehend written reports; | |
| | **7.4.** ability to write design and manufacturing reports | |
| | **7.5.** ability to present effectively, | |

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| | **7.6.** ability to give and follow clear instructions. | |
| **8** | **8.1.** Recognition of the need for lifelong learning; | |
| | **8.2.** ability to access information, to follow developments in science and technology, and to continue to educate him/herself. | |
| **9** | **9.1.** Consciousness to behave according to ethical principles, and about professional and ethical responsibility; | |
| | **9.2.** knowledge on standards used in engineering practice. | |
| **10** | **10.1.** Knowledge about business life practices such as project management, risk management, and change management; | |
| | **10.2.** awareness in entrepreneurship, innovation; | |
| | **10.3.** knowledge about sustainable development. | |
| **11** | **11.1.** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; | |
| | **11.2.** awareness of the legal consequences of engineering solutions. | |

| Revison Date | Prepared by | Approved by |
|---|---|---|
| 1.9.2019<br>1.6.2021 | Prof.Dr. Ümit Güz | Prof.Dr. Ahmet Aksen |