# ELEC4603 COURSE CATALOG INFO

| **Course Code : ELEC4603** | | | | **Course Name :** Microwave Engineering | | | |
|---|---|---|---|---|---|---|---|
| **Semester** | **Lecture (Le+T+L)** | **Local Credit** | **ECTS** | **Language** | **Category** | **Instructional Methods** | **Prerequisites** |
| 7 or 8 | (3+0+0) | 3 | 5 | English | Elective | Lecture | ELEC2202 |
| **Course Content** | Introduction to microwave engineering. Transmission lines. Impedance transformation and matching. Smith Chart. Microwave network analysis, matrix representations, generalized scattering parameters. Power dividers and directional couplers. Microwave filters. Microwave amplifiers. Introduction to antennas and microwave propagation. | | | | | | |
| **Course Outcomes** | **CO 1.** Analyze Transmission Line circuits at RF and microwave frequencies.<br>**CO 2.** Identify Smith Chart and use it for the analysis and design of matching circuits.<br>**CO 3.** Identify the characterization of two-port microwave networks using impedance, admittance, ABCD and Scattering parameters.<br>**CO 4.** Analyze and design microwave filters, power dividers, and directional couplers.<br>**CO 5.** Identify the microwave amplifier principles and use S-parameters for the maximum gain design of amplifiers.<br>**CO 6.** Identify the characteristics of microwave antennas and radiating systems. | | | | | | |

| **COURSE PLAN** | |
|---|---|
| W1 | Introduction to microwave engineering and transmission lines |
| W2 | Transmission line theory, analysis of terminated transmission lines |
| W3 | Transmission line theory, analysis of terminated transmission lines |
| W4 | Smith Chart and impedance matching applications |
| W5 | Smith Chart and impedance matching applications |
| W6 | Microwave network characterization: ABCD and Scattering matrices |
| W7 | Microwave network characterization: ABCD and Scattering matrices |
| W8 | Power dividers and directional couplers |
| W9 | Microwave Filters: Butterworth and Chebyshev characteristics, filter transformations, distributed filter design |
| W10 | Microwave Filters: Butterworth and Chebyshev characteristics, filter transformations, distributed filter design |
| W11 | Introduction to microwave amplifiers: Design of maximum gain amplifiers |

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| W12 | Introduction to microwave amplifiers: Design of maximum gain amplifiers |
| W13 | Introduction to antennas: Antenna parameters and radiation pattern characteristics |
| W14 | Introduction to transmit-receive systems, microwave propagation and microwave hazards |

| 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 | 24 | 24 |
| Quizzes | | | 0 |
| Term project | | | 0 |
| Reports | | | 0 |
| Final Project | | | 0 |
| Seminar | | | 0 |
| Assignments | 3 | 14 | 42 |
| Presentation | | | 0 |
| Midterms | | | 0 |
| Project | | | 0 |
| Laboratory | | 0 | 0 |
| Tutorial | 14 | 3 | 42 |
| Other(Self study, Paper reviews) | | | 0 |
| | | **Total work load** | 150 |
| | | **Total work load/25** | 6 |
| | | **ECTS Credit** | 6 |

| PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS | | |
|---|---|---|
| **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. | |
| **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, | |
| | **7.6.** ability to give and follow clear instructions. | |
| **8** | **8.1.** Recognition of the need for lifelong learning; | |

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|---|---|---|
| | **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. Ahmet Aksen | Prof.Dr. Ahmet Aksen |