

ELEC2601 COURSE CATALOG INFO

| Course Code : ELEC2601 | | | | Course Name : Electromagnetic Fields and Waves | | | |
|------------------------|--|--------------|------|--|----------|-----------------------|---|
| Semester | Lecture (Le+T+L) | Local Credit | ECTS | Language | Category | Instructional Methods | Prerequisites |
| 4 | (4+1+0) | 4 | 6 | English | Core | Lecture | PHYS1102, MATH2103 OR MATH2105 |
| Course Content | Electrostatic fields. Dielectric properties of materials. Stationary electric currents and static magnetic fields. Time-varying electromagnetic fields. Faraday's induction. Maxwell's equations. Time-harmonic electromagnetic waves. Uniform plane waves. | | | | | | |
| Course Outcomes | <p>CO 1. Identify the properties of static electric and magnetic fields and use the vector analysis and coordinate systems in the study of static field problems</p> <p>CO 2. Identify the electromagnetic induction and use Faraday's law in the study of induction problems</p> <p>CO 3. Identify Maxwell's relations and solve the time-harmonic wave equation.</p> <p>CO 4. Examine the plane wave propagation in lossless media, lossy media and at different medium interfaces.</p> <p>CO 5. Examine the flow of electromagnetic power.</p> | | | | | | |

| COURSE PLAN | |
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| W1 | Review of vector algebra, coordinate systems, gradient, divergence, curl operators |
| W2 | Electrostatics: Coulomb's law, Gauss's law, Electric potential |
| W3 | Magnetostatics: Ampere's law, Biot Savart Law |
| W4 | Steady electric currents, capacitive and inductive structures |
| W5 | Time varying fields, Faraday's law of electromagnetic induction |
| W6 | Maxwell's equations, boundary conditions |
| W7 | Wave equation and its solution |
| W8 | Time harmonic fields, time domain and phasor representations |
| W9 | Plane waves in lossless media, wave polarization |
| W10 | Plane waves in lossy media |
| W11 | Flow of electromagnetic power, Poynting vector |

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| W12 | Wave reflection and transmission at different medium interfaces |
| W13 | Wave reflection and transmission at different medium interfaces |
| W14 | Wave reflection and transmission at different medium interfaces |

| COURSE ASSESMENT AND ECTS WORK LOAD | | | |
|--|--------------|--|------------------|
| Type of Work | Count | ECTS WORK LOAD | |
| | | Time (Hour)(Including prep. time) | Work Load |
| Attendance | 14 | 4 | 56 |
| Final Exam | 1 | 21 | 21 |
| Quizzes | | | 0 |
| Term project | | | 0 |
| Reports | | | 0 |
| Final Project | | | 0 |
| Seminar | | | 0 |
| Assignments | 4 | 2 | 8 |
| Presentation | | | 0 |
| Midterms | 2 | 10 | 20 |
| Project | | | 0 |
| Laboratory | | | 0 |
| Tutorial | 14 | 1 | 14 |
| Other(Self study, Paper reviews) | 14 | 4 | 56 |
| | | Total work load | 175 |
| | | Total work load/25 | 7 |
| | | ECTS Credit | 7 |

COURSE ASSESMENT AND ECTS WORK LOAD

| PO | Program Outcomes | CO |
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| 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); | 1,2,3 |
| | 1.2. ability to use theoretical and applied knowledge in these areas in complex engineering problems. | 1,2,3 |
| 2 | 2.1. Ability to identify, formulate, and solve complex engineering problems; | 4,5 |
| | 2.2. ability to select and apply proper analysis and modeling methods for this purpose. | |
| 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. | |

| Revision Date | Prepared by | Approved by |
|----------------------|----------------------|----------------------|
| 1.9.2019 | Prof.Dr. Ahmet Aksen | Prof.Dr. Ahmet Aksen |
| 1.6.2021 | | |