AEEE313 - Transmission Lines and Waves

Course Title	Transmission Lines and Waves				
Course Code	AEEE313				
Course Type	Compulsory				
Level	BSc (Level 1)				
Year / Semester	3rd / 2nd				
Teacher's Name	Dr. Photos Vryonides				
ECTS	6	Lectures / week	3	Laboratories/week	1
Course Purpose	The aim of the course is to familiarize the students with transmission line analysis techniques and analyze structures propagating TE, TN or TEM modes such as coaxial lines, microstrip lines, strip lines and rectangular waveguides in order to attain knowledge and skills in designing transmission line circuits and impedance matching.				
Learning Outcomes	By the end of the course, students must be able to: 1. Review of fundamental topics in electromagnetic theory and define travelling waves and explain sinusoidal waves in a lossless medium in order to identify how wave propagation is described in equations. 2. Represent TEM transmission lines its equivalent lumped element circuit and explain the line parameters in order to derive the telegrapher's equations. . 3. Describe the lossless microstrip transmission line and perform examples to calculate the propagation properties and parameters. 4. Explain the lossless transmission line and derive the propagation constant the phase velocity and the characteristic impedance. Define the reflection coefficient and the VSWR and perform examples with different load impedances. 5. Identify the graphical tools for analysing and designing transmission line circuits and facilitate calculations involving complex impedances and impedance matching circuits.				
Prerequisites	AEEE312, AEEE223	Corequisites	NONE		
Course Content	**Introduction to Waves**.:Electric and Magnetic Fields. Traveling Waves. **Transmission Lines:** Wavelength. Propagation modes. Modeling of transmission lines. Line parameters. Lossless and lossy lines. Reflection. Standing waves. VSWR. Input Impedance.				

	Smith chart: Line stub matching and quarter wave transformer. **Waveguides:**Applications. Propagation modes. Governing equations. Cutoff frequency and wavelength. **Laboratory work:** Individual and small group experiments performed with the use of Electronic boards, components, measuring instruments and simulation packages. Experiments include the design, construction on Electronic boards and analysis of the circuits and devices taught in theory. Testing is performed using signal measuring equipment such as digital multimeters, oscilloscopes and spectrum analysers. The performance of the designed circuits is also simulated and the results are evaluated and compared with the experimental analysis.
Teaching Methodology	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the e-learning platform or the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Furthermore, design projects may be assigned to the students, where literature search is encouraged to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem, implement to implement the design and report the results in written or orally. Laboratory experiments are carried out in small groups and lab reports are required two weeks after the laboratory class resulting in a cumulative mark.
Bibliography	**(o) Textbooks:** • **F. T. Ulaby, *Fundamentals of Applied Electromagnetics***,8th Edition Prentice Hall, 2019. **(p) References:** • **David Pozar, Microwave Engineering**, 4th Edition, Wiley, 2012
Assessment	The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final written exam. The coursework and the final exam grades are weighted 40% and 60%, respectively, and compose the final grade of the course. Various approaches are used for the continuous assessment of the students, such as mid-term written exam, oral exam, quizzes, design assignments, design projects and laboratory experiments. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below:

	• Assignments 10% • Homework 10% • Mid-Term written exams 30% • Design Project 20% • Laboratory Work 20% • Quizzes 10% Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constrains and revision timetable. The criteria considered for the assessment of each type of the continuous assessment and the final exam of the course are: (i) the comprehension of the fundamental concepts and theory of each topic, (ii) the application of the theory in solving related problems and (iii) the ability to apply the above knowledge in more complex design problems. The above criteria are weighted 30%, 40% and 30%, respectively. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Language	**English**