AEEE425 - Antennas and Radars

Course Title	Antennas and Radars				
Course Code	AEEE425				
Course Type	Technical Elective				
Level	BSc (1st Cycle)				
Year / Semester	4th / Fall				
Teacher's Name	Associate Prof Symeon Nikolaou				
ECTS	6	Lectures / week	3	Laboratories/week	0
Course Purpose	The aim of the course is to familiarize the students with the concepts and principles of antennas and radars. The students should be in position to identify the antenna parameters, derive two-dimensional radiation patterns and gain diagrams for single elements and for linear arrays. They should be competent to define the radiated electromagnetic fields starting from the ac current distribution and through the use of the vector magnetic potential for the basic linear wire antenna elements. They should be in position to explain the array factor and provide graphical representation of the resulted radiation pattern depending on the feeding excitations and to analyze the input impedance of the driving elements depending on the neighboring radiators. In addition they should become familiar with the fundamental radar parameters and should be in position to solve simple problems with mono-static and bi-static radars.				
Learning Outcomes	By the end of the course, students must be able to: 1. Manage fundamental antenna parameters problems. 2. Combine the radiation pattern of an individual radiator into a linear array, and plot such radiation patterns in Cartesian and polar diagrams 3. Assemble linear arrays considering the calculated mutual and self impedances for antenna arrays. 4. Assess the primary conditions that dictate the selection of a specific antenna type depending on the application. 5. Appraise the basic radar characteristics and recommend the appropriate type depending on the implementation requirements.				
Prerequisites	AEEE313	Corequisites	None		
Course Content	• Fundamentals of antennas: Understand the principal antenna parameters and make simple calculations. Model an antenna in simple transmitter and receiver circuits. • Linear antennas: Calculate antenna performance with time harmonic excitation. Compute and plot power density and far field radiation patterns. • Linear antenna arrays: Use the different types of excitation and phase difference techniques to meet different specifications. Plot power density and radiation patterns of broadside and endfire linear arrays				

	• Types of antennas for different applications: Get an idea of Loop antennas. Horn antennas. Helical antennas. Low frequency antennas, High frequency antennas. VHF and UHF Communication antennas. TV and FM transmission antennas. Solve problems related with microstrip patch antenna design. • • Basic radar principles: Get introduced to basic radar principles. Solve problems related to target detection and range estimation. Active and passive systems. Range, target velocity, incident power density. Range equation. Radar system description. Frequency bands. Radar antennas. Tracking antennas
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. Topic notes are compiled by students, during the lecture can also be downloaded from 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
Bibliography	**Textbooks:** • C. A. Balanis, Antenna Theory, Analysis and Design, 4th Wiley, 2016 **References:** • D. Pozar, Microwave Engineering, 4th ed. J. Wiley, 2012 • M. Skolnik, Introduction to Radar Systems, New York, McGraw-Hill, 3rd Edition, 2001.
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, quizzes. 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/Quizzes 20% • Mid-Term written exams 80% 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 20%, 60% and 20%, 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**