AEEE423 - RF Engineering

Course Title	RF Engineering				
Course Code	AEEE423				
Course Type	Technical Elective				
Level	BSc (Level 1)				
Year / Semester	4th (Spring)				
Teacher's Name	Dr. Photos Vryonides				
ECTS	6	Lectures / week	3	Laboratories/week	
Course Purpose	The aim of the course is to give the students the knowledwith 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. Compare and assess different transceiver architectures 2. Match passive and active components using RLC networks and distributed elements. 3. Develop the optimum LNA topologies considering the design parameters 4. Appraise the advantages and/or disadvantages of various PA topologies 5. Implement the use of oscillators and mixers in transceiver architectures. Design and implement filters meeting given specifications				
Prerequisites	AEEE238, AEEE313	Corequisites	None		
Course Content	• **Introduction:** R L C in high frequencies. Digital / Analogue modulation schemes S parameters.Series and parallel connection of networks. Chain scattering matrix. ABCD network representations. Conversion between Z and S matrixes • **Noise and distortion:** Multistage noisy circuits. Noise temperature. Thermal noise. Noise figure • **Matching networks:** Two component matching network. Quality factor. T and Pi matching networks. BJT matching networks. FET matching networks • **Filters:** Filter types and parameters. Butterworth – Type filters. Chebyshev – Type filters. Microstrip filters. Coupled filters				

	• **PAs/LNAs:** Stability considerations. Stability circles. Constant gain. Noise figure circles. Constant VSWR circles. Class A and B Pas. Class C Pas. • **Mixers/ Oscillators:** Feedback oscillator. Negative resistance oscillator. Single ended mixer. Single balanced mixer. Double balanced mixer • **Transceiver Architectures:** Receiver architectures. Heterodyne receivers. Homodyne receivers. Transmitter architectures. Direct conversion transmitters.
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..
Bibliography	**(s) <u>Textbooks:</u>** • David Pozar, **Microwave and RF Design of Wireless Systems,** John Wiley and Sons, 2012. • Reinhold Ludwig and Gene Bogdanov**, "RF Circuit Design Theory and applications",** Second Editon, 2008 **<u>References:</u>** • Behzad Razavi**,** "**RF Microelectronics**", 2nd Edition ,Prentice Hall, 2011
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 50%

	• Design Project 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**