University of Science and Technology of Hanoi
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COURSE SYLLABUS

Subject: Antennas and Microwave Engineering	**Academic field:** Information and Communications Technology and Space
Lecturer: Nguyen Ngoc Truong Minh, PhD	**Affiliation:** School of Electrical Engineering, International University, VNU-HCM
Phone: 0903 760 100	**E-mail:** nntminh@hcmiu.edu.vn
Academic year: 2015-2016	

COURSE DESCRIPTION

Credit points	03	
Level	Undergraduate	
Teaching time **Location**	In 8 weekdays University of Science and Technology of Hanoi (USTH)	
Time Commitment	Lecture	34 hrs
	Exercises	6 hrs
	Practical	0 hrs
	Total	40 hrs
Prerequisites	Electromagnetic Theory	
Recommended background knowledge	Differential Equations, Electromagnetic Theory	
Subject description	This course is intended for advanced senior undergraduate students in Electrical and Telecommunications Engineering programs. Broad range of topics in the field of RF/Microwave engineering will be covered. In particular, a detailed discussion on transmission lines, waveguides, impedance matching, microwave resonators, RF filters, RF amplifiers, and passive RF and microwave devices (couplers, mixers, duplexers, etc.) will be presented. Furthermore, an introduction to antenna design as well as RF/Microwave communications link design will be provided.	
Objectives & Out-come	**Objectives** Students are expected to be able to: 1. Understand basic antenna parameters, including radiation resistance, input impedance, gain and directivity 2. Expose to different types of antennas and measurements 3. Analyze transmission lines and waveguides 4. Use Smith Chart to perform impedance matching and other advanced microwave/RF system design 5. Design and analyze microwave/RF oscillators and/or mixers	

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	6. Design and analyze microwave/RF filters 7. Design and analyze end-to-end microwave/RF communication links 8. Read English textbook and to solve related problems 9. Ability to work as a team to solve a given problem (team project)	
Assessment/ Evaluation	Attendance/Attitude	10%
	Exercise(s)	15%
	Practical	__%
	Mid-term test	25%
	Final exam	50%
Prescribed Textbook(s)	[1] Constantine A. Balanis, "*Antenna Theory – Analysis and Design*", 3rd edition, John Wiley, 2005 [2] David M. Pozar, "*Microwave Engineering*", 4th edition, John Wiley, 2012 [3] David K. Barton, Sergey A. Leonov, "*Radar Technology Encyclopedia*", Artech House, 1998	

COURSE CONTENTS & SCHEDULE

During class time

1. Attend lectures given by lecturer or some of your classmates.
2. Use the required software (with your laptop and/or classmate's laptop) to simulate a specific circuit to practice what you have learnt in class.
3. Prepare and present in-group a complex circuit chosen from the list given by the lecturer.

At home

1. Do homework
2. Review the material given in previous classes and prepare for the next class

Class	Contents	Hours			Ref./Resources	Assignment(s)
		Lect.	Exr.	Prc.		
1	**Chapter 1 – Introduction** 1.1 Brief History of Microwaves and Antenna Systems 1.2 Frequency Spectrums 1.3 Wireless Applications 1.4 A Simple System Example	4				
2	**Chapter 2 – Antenna and Propagation for Wireless Systems** 2.1 Antenna Analysis and Parameters *2.1.1 Introduction* *2.1.2 Isotropic Radiator and Plane-Waves* *2.1.3 Far-Field Region* *2.1.4 Antenna Analysis* *2.1.5 Antenna Characteristics and Parameters*	8	2	0		

	2.2 Practical Antenna *2.2.1 Monopole and Dipole Antennas* *2.2.2 Horn Antennas* *2.2.3 Parabolic Antennas* *2.2.4 Microstrip Patch Antennas* *2.2.5 Antenna Arrays and Phased Arrays* 2.3 Friis Equations *2.3.1 Friis Equation* *2.3.2 Effective Isotropic Radiated Power* *2.3.3 Impedance mismatch* *2.3.4 Polarization mismatch* *2.3.5 Equivalent circuits for transmit and receive antenna* 2.4 Wave Propagation Problems					
	Chapter 3 – Microwave Components 3.1 Introduction and History 3.2 Couplers, Hybrids, and Power Dividers/Combiners 3.3 Resonators, Filters, and Multiplexers 3.4 Isolators and Circulators 3.5 Detectors and Mixers 3.6 Switches, Phase Shifters, and Attenuators 3.7 Oscillators and Amplifiers 3.8 Frequency Multipliers and Dividers Problems	8	2	0		
	Chapter 4 – Microwave Transceiver Architectures and System Parameters 4.1 Receiver *4.1.1 Typical Receiver Architectures* *4.1.2 System Considerations* *4.1.3 Natural Sources of Receiver Noise* *4.1.4 Receiver Noise Figure* *4.1.5 Compression Points, Minimum Detectable Signal, and Dynamic Range* 4.2 Transmitter *4.2.1 Transmitter architecture* *4.2.2 Transmitter Parameters* *4.2.3 Transmitter Noise* *4.2.4 Frequency Stability and Spurious Signals* *4.2.5 Frequency Tuning, Output Power, and Efficiency* Problems	6	1	0		
	Chapter 5 – Microwave Wireless Communication Systems 5.1 Introduction 5.2 Friis Transmission Equation 5.3 Space Loss 5.4 Link Equation and Link Budget 5.5 Effective Isotropic Radiated Power and G/T	8	1	0		

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	Parameters 5.6 Radio/Microwave Links 5.7 Satellite Communication Systems 5.8 Mobile Communication Systems and Wireless Cellular Phones Problems					

Notes:

- *Abbreviation: Lect. (Lecture), Exr. (Exercise), Prc. (Practice).*
- *Exercises may include assignment, reports, student's presentation, homework, class exercises... for each class sessions*
- *Practical mostly refer to Lab- work or outside practice such as field trip.*

References Literature

[1] Constantine A. Balanis, "*Antenna Theory – Analysis and Design*", 3rd edition, John Wiley, 2005
[2] David M. Pozar, "*Microwave Engineering*", 4th edition, John Wiley, 2012
[3] David K. Barton, Sergey A. Leonov, "*Radar Technology Encyclopedia*", Artech House, 1998