48. Antenna and Microwave Engineering (EE105IU)

Module designation	*The course provides students the understanding of radiation fundamentals, linear antennas, point source arrays, aperture antennas, antenna impedance, and antenna systems. Basic concepts of microwave engineering such as transmission lines, Smith plot, microwave circuits, analysis techniques, design and applications.*
Semester(s) in which the module is taught	1, 2
Person responsible for the module	MSc. Trần Văn Sư
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/4.62 ECTS
Required and recommended prerequisites for joining the module	Previous course: General Physics 2 (PH021IU) (or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))

Module objectives/intended learning outcomes	Upon the successful completion of this course students will be able to:	
	Competency level	**Course learning outcome (CLO)**
	Knowledge	CLO1. Collect in depth the principles of antenna radiation and radiation characteristics (input impedance, gain, half power beam width, and radiation power…).
	Skill	CLO2. Analyze the specific antennas such as: dipoles, loop, parabolic antennas and the antenna arrays
	Attitude	CLO3. Analyze and design topics of microwave engineering such as transmission line, Smith chart, scattering matrix

<table>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></tr>
<tr><td>Introduction and a Historical Perspective</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Antenna radiation characteristics: Input impedance, efficiency, radiation power</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Antenna radiation characteristics: radiation patterns, wave polarization, half power beam-width, gain, receiving antenna and antenna link.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Current radiate field, Maxwell's Equations and Source-Field Relationships, Hertzian dipoles, small loop antennas.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Finite length dipoles, line sources, ground planes and monopoles.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Linear arrays, array factor.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Broadside and endfire arrays. Planar arrays and pattern multiplication.</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Transmission line equations and properties. Standing Wave Patterns And VSWR. Introduction to Smith chart.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Impedance matching techniques.</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Microwave engineering, scattering matrix.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Low noise amplifier, power amplifier, Power divider, couplers, filters.</td><td>1</td><td></td></tr>
<tr><td>Review</td><td>1</td><td></td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Exam</td></tr>
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Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	**Textbook:** [1] Class notes **Reference:** [2] C.A. Balanis, Antenna Theory Analysis and Design, John Wiley & Sons, 1997