56. Radio Astrophysics (PH048IU)

Module designation	*The purpose of this course is to broaden students' knowledge in space science, to clearly understand how to use antennas in doing research in Astrophysics.*
Semester(s) in which the module is taught	1, 2
Person responsible for the module	Assoc. Prof. Phan Bảo Ngọc
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, assignment, homework
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 themodule	Parallel course: Antenna and microwave engineering (EE105IU), Antenna and microwave engineering laboratory (EE124IU)

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<td>Module objectives/intended learning outcomes</td>
<td>Upon the successful completion of this course students will be able to:
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<tr><th>Competency level</th><th>Course learning outcome (CLO)</th></tr>
<tr><td>Knowledge</td><td>CLO1. Apply knowledge of antenna theory in designing radio antennas for science purposes</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze signals and images of objects in space based on hands-on skills</td></tr>
<tr><td>Attitude</td><td>CLO3. Show abilities of further self-learning and longlife learning.</td></tr>
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<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>Chapter 1 An introduction to radio astrophysics</td><td>1</td><td>I, T</td></tr>
<tr><td>Chapter 2 Basic radiative transfer</td><td>2</td><td>T</td></tr>
<tr><td>Chapter 3 Blackbody radiation and radiation from an accelerated charge</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 4 Radio telescopes, receivers, and interferometers</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 5 Thermal continuum sources</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 6 Non-thermal continuum sources</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 7 Pulsars</td><td>2</td><td>T, U</td></tr>
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	Chapter 8 Spectral-line sources | 2 | T, U
Examination forms	Exam
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	[1] *Tools of Radio Astronomy*, T. L. Wilson, K. Rohlfs, S. Huttemeister, 5th Edition, Springer