COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Microwave Electronics	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Prof. Alvydas Lisauskas **Other(s):**	Physics Faculty, Institute of Applied Electrodynamics and Telecommunications

Study cycle	Type of the course unit (module)
Second	Obligatory

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Lectures	III (autumn) semester	Lithuanian

Requirements for students	
Prerequisites: Course in the subject of semiconductor physics	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	140	64	76

Purpose of the course unit (module): programme competences to be developed		
This course provides the student with the concepts required for physical understanding, design and test of high-speed electronic devices. Topics include standard electronic devices and circuits used in microwave frequency range as well as discussion on technology trends for high-speed electronics. The course is complemented with practical exercises including tasks on high-frequency design and testing techniques		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
To understand and to be able explain the operation principles of microwave semiconductor devices	Lectures, self-study	Colloquium, written exam
To be able to characterize of microwave devices, their frequency and power characteristics	Lectures, self-study, laboratory works	Completion of laboratory works
Learn operating microwave sources for physical and technological research	Lectures, self-study, laboratory works	Completion of laboratory works

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	**Contact hours**	**Self-study hours**	**Assignments**
1. Introduction into microwave electronics	2						**2**	**2**	Literature reading
2. Electronic transport in crystal lattice	2						**2**	**4**	Literature reading
3. Microwave diodes: P-I-N diode; Schottky diode; Gunn diode; IMPATT diode; Resonance tunneling diode	12				16		**28**	**34**	Literature reading, perform laboratory works
4. Microwave transistors: High electron mobility transistors, metal-oxide-semiconductor transistors; Heterojunction transistors, Ballistic transport	16				16		**32**	**36**	Literature reading, perform laboratory works
Total	**32**				**32**		**64**	**76**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Laboratory works	100	Semester	Students must perform following laboratory works: P-i-n attenuator and modulator. Gunn generator. IMPATT generator. Switching characteristics of microwave bipolar transistor. Microwave amplifier with Field Effect Transistor Short pulse generator with avalanche transistor.
Colloquium	60	Semester	**S1:** Electronic transport in crystal lattice **S2:** Operation of microwave diodes **S3:** Microwave transistors **S = 0,2*S1+0,4*S2+0,4*S3**
Exam	40	Session	For the exam the completion of laboratory work assignments is compulsory. Exam consists from two theory tasks (E1 and E2) and written exercise (E3). Each task is evaluated in 10 grade system. The weights for the final grade are: **E = 0,4*E1+0,4*E2+0,2*E3 Final: 0,6*S + 0,4*E**

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsary reading				
Simon M. Sze	2001	Semiconductor Devices: Physics and Technology	2nd Edition	Wiley
Kevin F. Brennan, April S. Brown	2002	Theory of Modern Electronic Semiconductor Devices		Wiley
William Liu	1999	Fundamentals of III-V Devices: HBTs, MESFETs, and HFETs/HEMTs		Wiley

Optional reading				
M. Lundstroem	2003	Fundamentals of Carrier Transport		Cambridge Univ. Press
Simon M. Sze	1997	Modern Semiconductor Device Physics		Wiley