

COURSE DESCRIPTION CARD

Faculty of Electrical Engineering										
Field of study	Electrical and Electronics Engineering							Degree level and programme type	bachelor's degree, full time programme	
Specialization/ diploma path	-							Study profile	-	
Course name	High Frequency Techniques 1							Course code	IS-FEE-10033S	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	summer	
	30	15						No. of ECTS credits	5	
Entry requirements	Mathematics, Physics, Circuits and Signals, Electromagnetic Field Theory									
Course objectives	The aim of the course is to acquaint the students with basic topics of high frequency techniques: components, instruments, measurements, applications. Training skills of calculation of voltages and currents in transmission lines and solving simple problems of impedance matching.									
Course content	Examples of applications of high frequency devices and systems. Electromagnetic waves in transmission lines (coaxial lines, striplines, microstrips) and in waveguides. Wave types (TEM, TE and TM) and wave modes. Definitions of current, voltage, characteristic impedance. Impedance matching (narrowband and broadband). The Smith chart. Multiport circuits. The scattering matrix. Passive microwave elements: reactance irises, matched loads, stub tuners, attenuators, phase shifters, power dividers, hybrid junctions, directional couplers. Resonators. Ferrite devices. Semiconductor devices. MEMS. Basics of high frequency measurements. Network analyzers.									
Teaching methods	lecture, class.									
Assessment method	lecture: discussion on homework reports; class: two tests.									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
L01	has detailed knowledge on the principles of operation of electronic high frequency components;									
L02	has elementary knowledge on materials used in the high frequency technology;									
L03	has ordered, theoretical knowledge on guiding of high frequency waves;									
L04	knows and understands basic methods of measurements of parameters of high frequency devices;									
L05	can get information from the literature and other sources,									

	also in a foreign language;		
LO6	can use the known mathematical description for solving basic problems concerning transmission lines;		
LO7	can apply the Smith chart for analysis of simple impedance matching problems.		
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	evaluating the student's homework, and discussion on it	L	
LO2	evaluating the student's homework, and discussion on it	L	
LO3	evaluating the student's homework, and discussion on it	L	
LO4	evaluating the student's homework, and discussion on it	L	
LO5	evaluating the student's homework, and discussion on it	L, C	
LO6	tests on classes content	C	
LO7	tests on classes content	C	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	28	
	discussion on homework reports	2	
	participation in classes	13	
	tests related to the classes	2	
	preparation for classes	5	
	homework reports	30	
	participation in student-teacher sessions related to the class	15	
	preparation for exams/tests	40	
TOTAL:		135	
Quantitative indicators		HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation		60	2
Student workload – practical activities		75	3
Basic references	1. Collin R. E.: Foundations for microwave engineering. IEEE Press, 2001. 2. White J. F.: High frequency techniques - an introduction to RF and microwave engineering. Wiley, 2004. 3. Elliott R. S.: An introduction to guided waves and microwave circuits. Prentice-Hall, 1998.		
Supplementary references	1. Hickman I.: Practical radio frequency handbook. Newnes, 2002. 2. Bowick C.: RF circuit design. Newnes, 1982. 3. IEEE Microwave Magazine. 4. Aniserowicz K.: lecture notes		
Organisational unit conducting the course	Department of Photonics, Electronics and Lighting Technology	Date of issuing the programme	
Author of the programme	Prof. Karol Aniserowicz	12.02.2020	

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,

S – seminar