ECTS catalog with learning outcomes
University of Montenegro

Faculty of Electrical Engineering / /

Course:				
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
12792	Mandatory	1	5	3+1+0
Programs				
Prerequisites	No prerequisites.			
Aims	Students become familiar with the functions of basic radio technical assemblies and architectures, and learn to dimension the parameters of individual assemblies. Also, students are introduced to the architectures of current and future radio transceivers.			
Learning outcomes	After passing this course, the student will be able to: 1. Explain the specifics and design problems of RF components, as well as complete circuits within transmitters and receivers 2. Sketches the architectures of superheterodyne and direct receivers 3. Dimension the parameters of selective circuits and adjustment circuits 4. Defines the parameters affecting the design of small signal RF amplifiers and mixer circuits 5. Explain the principle of operation of the phase loop and analytically determine the parameters of the frequency synthesizer circuit 6. Classifies types of power amplifiers, describes their characteristics, application and principles of linearization 7. Present examples of different transceiver architectures (broadcast, 2G-5G, WLAN, etc.)			
Lecturer / Teaching assistant	Prof. dr Enis Kočan. Assistant: Ana Jeknić, BSc			
Methodology	Lectures, exercises, homework, consultations, preparation of seminar works.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Introduction. Basic terms and study area			
I week exercises	Specifics of RF design. Impedance matching measures			
II week lectures	RF receivers architectures			
II week exercises	Comparison of RF receivers architectures			
III week lectures	Basic parameters of RF receiver design			
III week exercises	Noise factor and equivalent noise temperature of cascade assemblies. RF receiver sensitivity			
IV week lectures	Selective circuits and impedance matching circuits			
IV week exercises	Dimensioning of oscillator circuit parameters. L, π and T scheme			
V week lectures	RF components			
V week exercises	Characteristics of monolithic resonators. Mixers			
VI week lectures	The first colloquium			
VI week exercises				
VII week lectures	Small signal RF amplifiers			
VII week exercises	Linearity of bipolar and unipolar transistors. Analysis of the transistor as a linear circuit with two pairs ends			
VIII week lectures	Stability of RF amplifiers			
VIII week exercises	Intercept point of cascade circuit			
IX week lectures	Frequency synthesis			
IX week exercises	Frequency instability of the oscillator. Dimensioning of frequency synthesizers			
X week lectures	Power amplifiers - role, position, linear power amplifiers			
X week exercises	Power amplifiers of class A, B and AB			
XI week lectures	Non-linear power amplifiers. Linearization principles			
XI week exercises	Power amplifiers of class C, D and E. Linearization principles			
XII week lectures	The second colloquium			
XII week exercises				

XIII week lectures	Trends in radio engineering
XIII week exercises	
XIV week lectures	Remedial colloquium
XIV week exercises	
XV week lectures	Presentation of seminar works.
XV week exercises	
Student workload	

Per week	**Per semester**
5 credits x 40/30=6 hours and 40 minuts 3 sat(a) theoretical classes 0 sat(a) practical classes 1 excercises **2 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **6 hour(s) i 40 minuts x 16 =106 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **6 hour(s) i 40 minuts x 2 =13 hour(s) i 20 minuts** Total workload for the subject: **5 x 30=150 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **30 hour(s) i 0 minuts** Workload structure: **106 hour(s) i 40 minuts (cources), 13 hour(s) i 20 minuts (preparation), 30 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes, do both colloquiums and seminar papers.
Consultations	Consultations are held after teaching lecture, and if necessary, at additional times, in agreement with the subject teacher.
Literature	- Lecture material. - Jon B. Hagen, Radio-frequency Electronics, Cambridge University Press, 2009. - Ian Robertson, Nutapong Somjit, M. Chongcheawchamnan, Microwave and Millimeter-Wave Design for Wireless Communications, Wiley, 2016
Examination methods	- The first colloquium carries 20 points, - The second colloquium carries 20 points, - The seminar paper carries 15 points, - Homework – 5 points, - Final exam 40 points.
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points