



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Radioelectronics technique [S2EiT1-MIEPU>TR]

### Course

Field of study

Electronics and Telecommunications

Year/Semester

2/3

Area of study (specialization)

Multimedia and Consumer Electronics

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

30

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr inż. Jarosław Szóstka

jaroslaw.szostka@put.poznan.pl

### Lecturers

### Prerequisites

A student should have a basic knowledge of electronic circuits, transmission lines, antennas and electric metrology, should also be able to analyze simple AC/DC circuits, to acquire information from suggested literature sources, and should be ready for teamwork.

### Course objective

Understanding the principle of operation and potential behaviour of physical RF devices and circuits, learning the basic physical and mathematical formulae necessary for design, deployment, maintenance and measurements of RF circuits and equipment.

### Course-related learning outcomes

Knowledge:

After completing the course a student:

1. knows and understands the process of design and construction of simple electronic circuits, design methodology of analogue RF circuits, and design techniques and methods
2. has a systematic knowledge, together with necessary mathematical background, of the fundamentals of analog RF circuits

3. has a systematic knowledge, together with necessary mathematical background, of RF circuit design and their electromagnetic compatibility and lifecycle
4. has a basic knowledge of non-technical aspects of engineering work and preparation of technical documentation, knows basic environment, health and safety guidelines.

#### Skills:

After completing of the course a student:

1. is able to extract information from literature, databases and other sources, is able to synthesize gathered information, draw conclusions, and justify opinions
2. is able to design a simple printed circuit board (PCB) using catalogues and application notes
3. is able to design and maintenance simple transmitting and receiving RF circuits, assess the cost of construction
4. is able to deploy and test the prototype of an RF circuit according to the safety rules, choose proper measurement methods and equipment typical for RF measurements
5. is able to notice non-technical (environmental, economic, legal) aspects of RF circuits and is familiar with ETSI standards, EU directives and national acts on EMC.

#### Social competences:

After the completing of the course a student:

1. understands the need of continuous education and raising professional, personal and social competences
2. is responsible for his own activities and is ready to be a member of a working team
3. is aware of professional behaviour and aethics
4. understands the role of national and international standards, directives and acts in electronics and telecommunications.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

- lecture knowledge - written and/or oral exam (90 minutes, 3-5 questions, 50% threshold - grade 3.0, the list with the exam problems is available as an e-mail)
- laboratory skills - the average grade from lab reports; the report requirements are presented during introductory classes, the report grade comprises the assesment of the formal agreement with the report template, the assessment of measurement data processing and presentation, and written explanation of problems.

### Programme content

Presentation of operation principle, design and measurements of radio communication circuits.

### Course topics

#### Lecture

1 Electronic devices - resistors, capacitors, inductors, RF transformers, resonant circuits, design of impedance matching networks; noise in electronic devices, design of PCB, shielding, em. compatibility of electronic equipment, block diagrams and parameters of transmitters and receivers, analysis and design of RF voltage and power amplifiers, quartz and LC generators, PLL generators and mixers, measurement equipment for RF equipment and signals, basic RF measurements, ETSI standards, EU directives for radio equipment, EU EMC directive, preparation of technical documentation and production cycles.

#### Laboratory exercises

1. Intermodulation
2. Measurement of s parameters an RF amplifier
3. RF power amplifier
4. LC resonant circuits
5. FM walkie talkie

### Teaching methods

Lectures - multimedia presentation

Laboratory exercises - practical exercises in groups (3-4 people)

4. LC resonant circuits
5. FM walkie talkie

## Bibliography

### Basic

1. Szóstka J., Mikrofałe. Układy i systemy, Wyd. Komunikacji i Łączności, Warszawa, 2006.
2. Nosal Z., Baranowski J., Układy elektroniczne. Układy analogowe liniowe. Wyd. Naukowo-Techniczne, Warszawa 1994.
3. Szóstka J., Miernictwo radiokomunikacyjne, Wyd. PP. Poznań 2021.

### Additional

1. Young P., Electronic Communication Techniques, Prentice Hall, 2004.
2. Gilmore R., Besser L., Practical RF Circuit Design for Modern Wireless Systems, Artech House, 2003.
3. Masewicz T., Radioelektronika dla praktyków, Wyd. Komunikacji i Łączności, Warszawa, 1985.
4. Poradnik radioamatora, praca zbiorowa, Wyd. Komunikacji i Łączności, Warszawa, 1984.
5. Bieńkowski Z., Poradnik ultrakrótkofalowca , Wyd. Komunikacji i Łączności, Warszawa, 1988.
6. Vizmuller P., RF Design Guide. Systems, Circuits, and Equations, Artech House, London, 1995.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	58	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	42	2,00