COURSE DESCRIPTION CARD - SYLLABUS

Course name
High Frequency Techniques [S2FT2>TWC]

Course

Field of study
Technical Physics

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr inż. Adam Buczek prof. PP
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Lecturers

Prerequisites

1. Basic knowledge concerning physics, electrotechnics, electronics and mathematics. 2. Ability to work with computer and basic laboratory devices and apparatus. Capability to acquire information from given sources. 3. Understanding of necessity of own competence broadening, responsibility for created technical soultions.

Course objective

1. Hand over knowledge concerning theoretical basics and practical solutions applied in techniques of high electromagnetic frequencies. 2. Develop students abilities to choose elements and devices useful in techniques of high frequencies. 3. Mold students responsibility for created systems.

Course-related learning outcomes

Knowledge:
Knowledge about crucial parameters of functional materials and basic electronic elements (passive and active) applied in high frequency techniques
Knowledge within parameters and constructions of chosen devices used for generation, transformation and transmission of high frequency signals

Knowledge about working of devices and measurement apparatus in high frequencies range, based on based on physics and electronics principles
Knowledge within applications of high frequency techniques in science and modern technology

Skills:
Using (with understanding) recommended engineering knowledge sources (basic bibliography), and current literature (e.g. books, proffesional magazines, documentations of producers e.t.c.)
Planning of choosing a proper materials, elements, modules and apparatus for high frequency systems
Operating of chosen devices working in high frequency range

Social competences:
Is aware of the threats arising when using high-frequency systems and the need for professional and responsible operation of such systems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In terms of the methods used to verify the achieved learning outcomes, the following grading thresholds are applied:
50.1-60% - satisfactory;
60.1-70% - satisfactory plus;
70.1-80% - good;
80.1-90% - good plus;
from 90.1% - very good.
The grade is based on an individual written assignment and/or the assessment of an oral response.

Programme content

Sources of knowledge in scope of high frequency techniques,
Properties of devices and signals in high frequency range. Decibel calculations,
Description of alternating signals using of complex numbers,
Passive elements of high frequency devices,
Energy distribution in high frequency systems,
Distributed circuits,
Matrix analysis of high frequency circuits,
Electromagnetic fields and waves,
Chosen components for high frequency range,
Chosen devices for high frequency range,
Applications of high frequency techniques in modern science and technology,
Ergonomic and safety in building and exploitation of high frequency devices.

Course topics

1. Sources of knowledge in scope of high frequency techniques (e.g. books, proffesional magazines, documentations of producers e.t.c.),
2. Properties of devices and signals in high frequency range. Decibel calculations,
3. Description of alternating signals using of complex numbers,
4. Passive elements of high frequency devices:
- Resistor (model and real parameters in high frequency range),
- Coil (model and real parameters in high frequency range),
- Capacitor (model and real parameters in high frequency range),
- Serial and parallel connections of elements (impedance, admittance, quality),
5. Energy distribution in high frequency systems:
- RLC resonance,
- Coupling of resonator with system
- Impedance transformation and matching,
6. Distributed circuits:
- Equations and parameters of transmission lines,
- The Smith Chart,
7. Matrix analysis of high frequency circuits,

8. Electromagnetic fields and waves,
9. Chosen components for high frequency range:
- Transmission lines and waveguides,
- Filters, couplers, dividers, resonators, mixers,
- Components with ferrimagnetic elements,
- Semiconductor and tube elements,
10. Chosen devices for high frequency range:
- Amplifiers,
- Generators,
- RLC meters,
- Power meters,
- Spectrum analyzers,
11. Applications of high frequency techniques in modern science and technology,
12. Ergonomic and safety in building and exploitation of high frequency devices.

Teaching methods

Lecture: multimedial presentation.
Laboratory classes: practical exercises, experiments, measurements, discussion, teamwork.

Bibliography

Basic:
1. Joseph F. White, High Frequency Techniques : An Introduction to RF and Microwave Engineering, Wiley, Hoboken New Jersey 2004,
2. J.Szóstka, Mikrofale - układy i systemy, WKŁ, Warszawa 2006,
3. J.Szóstka, Fale i anteny, WKŁ Warszawa 2006

Additional:
1. D.M.Pozar, Microwave Engineering, Wiley, Hoboken New Jersey 2012,
2. Magazine "Świat Radio", ISSN 1425-1701,
3. Magazine „Elektronik”, ISSN 1248-4000,
4. Magazine „Elektronika dla Wszystkich”, ISSN 1425-1608,
5. Magazine "Elektronika Praktyczna", ISSN 1230-3526.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	63	2,50