GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Integrated Active Circuits for Wireless Communications, PG_00048662		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Nyka	
	Teachers	dr hab. inż. Krzysztof Nyka	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	45	6.0	24.0	75

Subject objectives

Theoretical knowledge about concepts, operation, analysis, measurements and basic design procedures of the RF and microwave active circuits for wireless communication systems. Theoretical knowledge about designing RF active circuits using planar microwave circuit technologies and about using monolithic integrated circuits. Practical skills in analysis and basic design of RF active circuits in advanced CAD simulation software.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	Student knows properties of operation, methods of simulation, measurements and fabrication of RF active circuits for wireless communication	[SW1] Assessment of factual knowledge
[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	Students knows problems concerning fsabrication of RF active circuits in available technologies	[SW1] Assessment of factual knowledge
K7_K02	Student applies theoretical knowlegde from the lectrues for solving practical problems during the design of RF active circuits	[SK2] Assessment of progress of work
[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	Student determines parameters of active circuits and their influence on operation and performance of wireless communication system. Students interprets design requirements and designs active RF circuits.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

Lecture

- Introduction to active RF circuits and review of RF integrated circuit technologies
- RF transistor amplifiers – classification, parameters; biasing of the RF transistors
- Small signal amplifier design – conjugate match, definitions of gain, constant gain circles
- Lumped and distributed matching networks
- Small signal amplifier design – stability
- Low noise amplifier – noise matching, constant noise figure circuits
- Broadband RF amplifiers
- Nonlinear distortions and other nonlinear effects in RF circuits, the methods of large signal simulation in ADS
- RF transistors power amplifiers – class A, AB
- RF transistors power amplifiers – techniques of linearization and efficiency improvement
- RF transistors oscillators – introduction to feedback and negative resistance oscillators

Laboratory

- Small signal simulation of RF transistors in ADS, introduction to ADS
- Design and investigation of narrowband RF transistor small signal amplifiers
- Broadband and selective stabilization of RF transistor amplifiers
- Large signal simulation in ADS (HB, Transient) – introduction
- Investigation of nonlinear effects in RF amplifiers

Prerequisites and co-requisites

Basic knowledge of the RF active circuits characterization and principles of RF amplifier design.
Recommended prior course: Wireless Circuit Design

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory - presence and reports	50.0%	40.0%
Lecture - final test	50.0%	50.0%
Lecture - presence	0.0%	10.0%

Recommended reading

Basic literature	1. D. Pozar, Microwave Engineering John Wley&Sons 1998 2. Advanced Design System 2012.08 Documentation Set
Supplementary literature	1. F. Ellinger, Radio Frequency Integrated Circuits and Technologies, Springer-Verlag, 2007
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Compare different types of impedance matching in RF amplifiers.

Present properties of operation of RF transistor biasing networks

Work placement

Not applicable