GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Integrated Active Circuits for Wireless Communications, PG_00048662		
Field of study	Informatics, Electronics and Telecommunications		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Nyka	
	Teachers	dr hab. inż. Krzysztof Nyka	

Lesson types	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_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	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_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	Students knows problems concerning fabrication of RF active circuits in available technologies and the techniques of their analys using advanced simulation tools	[SW1] Assessment of factual knowledge
[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the 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 using adwanced computer programs for electronic circuit simulation.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[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

Subject contents

Course content – 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

Course content – 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 Documentation Set.
Supplementary literature	1. F. Ellinger, Radio Frequency Integrated Circuits and Technologies, Springer-Verlag, 2007.
eResources addresses	

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

Practical activites within the subject

Not applicable

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