



## Subject card

Subject name and code	CAD for High Frequencies Network and System Design, PG_00048666						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2027/2028		
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	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	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 mgr inż. Michał Baranowski					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30		4.0		16.0	50
Subject objectives	The aim of the course is to familiarize students with the CAD tools (and their limitations) used in high-frequency electronics. The course allows the student to explore specific aspects of computer aided modeling systems for very high frequencies - from the system level modeling to physical properties of elements,						

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	The student knows the algorithmic principles of computational methods used in CAD tools for electromagnetic simulations and optimization	[SW1] Assessment of factual knowledge
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	The student is able to configure electromagnetic simulators in CAD tools, adapting them to the specifics of a given design task	[SU1] Assessment of task fulfilment
	[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	The student is able to analyze the operation of RF circuits in terms of selecting appropriate CAD tools and types of electromagnetic simulations	[SU4] Assessment of ability to use methods and tools
	[K7_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices	The student knows and understands the operating principles of simulators used in CAD tools with respect to circuit level and electromagnetic simulation methods	[SW1] Assessment of factual knowledge
Subject contents	<p>Course content – lecture</p> <ul style="list-style-type: none"> <li>• Specific aspects of computer-aided CAD modeling of very high frequency (VHF/RF) circuits</li> <li>• Fundamentals of the Finite-Difference Time-Domain (FDTD) method in electromagnetic simulation of RF circuits</li> <li>• Fundamentals of the Method of Moments (MoM) in electromagnetic simulation of RF circuits</li> <li>• Fundamentals of the Finite Element Method (FEM) in electromagnetic simulation of RF circuits</li> <li>• Overview of electromagnetic simulation method implementations in selected commercial CAD tools (Keysight Momentum, EMPro)</li> <li>• Overview of optimization methods in RF circuit design</li> </ul>		
	<p>Course content – laboratory</p> <ul style="list-style-type: none"> <li>• Introduction to optimization in the AWR MWO simulator</li> <li>• Electromagnetic simulation of planar circuits in AWR MWO/Axiem</li> <li>• Filter synthesis tools in AWR MWO</li> <li>• Introduction to the Altair FEKO 3D electromagnetic simulator modeling, simulation, cosimulation, and optimization</li> <li>• Introduction to the Ansys HFSS 3D electromagnetic simulator</li> </ul>		
Prerequisites and co-requisites	Fields and Waves, Electromagnetics, microwave circuits, numerical techniques, optimization		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Attendance i labs	100.0%	0.0%
	Quiz	50.0%	100.0%

Recommended reading	Basic literature	1. Bhargava, A., et al.: "Advanced Design System Circuit Design Cookbook 1.0", Agilent Technologies, 2008 2. Sadiku, M.N.O.: Numerical Techniques in Electromagnetics, 2nd Ed., CRC Press, Boca Raton, Floryda, USA, 2001 3. Swanson, D.G, Hoefler, W.J.R.: Microwave Circuit Modeling Using Electromagnetic Field Simulation, Norwood, MA, Artech House, 2003
	Supplementary literature	Not defined
	eResources addresses	
Example issues/ example questions/ tasks being completed	Compare fullwave simulation methods with respect to their capabilities for analyzing open structures and antennas. Passive circuit design using various simulators and CAD packages and analysis of the results	
Practical activities within the subject	Not applicable	

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