



HÖGSKOLAN I GÄVLE

Passive Microwave Devices 7.5 cr

Passiva mikrovågskomponenter 7,5 hp

Set by Faculty of Engineering and Sustainable Development

Version

Set at

Valid from

10/11/13

HT2014

Level	A1F
Education level	Second cycle
Course identifier	EEA302
Credits	7.5 cr
Main field of study	Electronics
Subject group	Electronics
Disciplinary domain	Technology 100.0 %

Learning outcomes

The course provides knowledge in general properties of passive microwave devices, the electromagnetic theory behind their operation. Emphasis is placed both on the electromagnetic aspects important for device design and on system aspects. Among the systems discussed are different microwave communication systems.

The course is suited both for microwave design engineers and those who encounter passive microwave components as sub-components in RF, microwave or optical systems. The course includes practical laboratory exercises involving the use of both computerized industry-standard design tools and standard RF measurement instrumentation.

After completion of the course the student shall be able to

1. apply electromagnetic theory to calculations regarding the different parameters and properties used to characterize common passive devices such as power dividers, directional couplers, antennas
2. make theoretical calculations of fundamental antenna elements such as dipoles and array antennas
3. have knowledge of some antenna systems and the demands of such on the antenna components
4. use commercially available program for antenna simulation
5. handle microwave equipment and make measurements.

Course content	<p>Introduction: Microwave communication systems and passive microwave devices Power dividers and couplers. T junction, Wilkinson power divider, quadrature (90) hybrid, the 180 hybrid, other couplers Filters using resonators. Quarter-wave resonators, capacitively coupled series and shunt resonators Ferrimagnetic components. Ferrite isolators, ferrite phase shifters, ferrite circulators Fundamental antenna parameters. Radiation mechanism, radiation patterns, beam widths, side-lobes, directivity gain, polarization, radiated power Wire antennas. Small dipole, radiation patterns, input impedance, mutual coupling Array antennas. N-element linear array, analysis, synthesis Aperture antennas. Rectangular apertures, horn antennas, diffraction theory, radiation integrals Patch antennas Antennas for mobile communications</p>		
Teaching	<p>The education is performed as lectures, exercises, and laboratory work. The laboratory work is normally performed in groups of two students. Emphasis is put on the student's capability of accomplishing and reporting the work. The lectures and exercises are not mandatory for the student. However, participation in laboratory work and assignment tasks is mandatory. Laboratory exercises: 173E Network analyzer 183E Radiation pattern measurements of X-band antennas 184E Design, simulation and manufacturing of a patch antenna</p>		
Prerequisites	Elements of Microwave Engineering 7.5 cr or equivalent.		
Examination	Written examination and laboratory exercises.		
Grade	A, B, C, D, E, Fx, F		
Other regulations	Criteria for final grade will be given at the beginning of the course.		
Sustainable environment	A minor part of the course content deals with sustainable development.		
Module			
	0010 Written examination	6 cr	Grade: AF
	0020 Laboratory exercises	1.5 cr	Grade: UG