



## HÖGSKOLAN I GÄVLE

### Active Microwave Devices 7.5 cr

*Aktiva mikrovågssystem 7,5 hp*

Set by Faculty of Engineering and Sustainable Development

**Version**

**Set at**

**Valid from**

10/11/13

**HT2015**

<b>Level</b>	A1F
<b>Education level</b>	Second cycle
<b>Course identifier</b>	EEA306
<b>Credits</b>	7.5 cr
<b>Main field of study</b>	Electronics
<b>Subject group</b>	Electronics
<b>Disciplinary domain</b>	Technology 100.0 %

**Learning outcomes**

The aim of the course is to give knowledge and understanding of active microwave components and systems. In a mandatory assignment, an active microwave system component is designed and evaluated.

After completion of the course the student shall be able to

1. state and have a good overview over how amplifier/oscillator design using a modern EDA software is working
2. design and calculate the overall performance of a radio-frequency amplifier/oscillator from given fundamental properties and limitations
3. describe the theory behind amplifier/oscillator/detector/mixer design for RF
4. describe the different problems in amplifier/oscillator design and understand their contribution to the whole system
5. implement amplifier/oscillator design in software
6. benefit from scientific reports and manufacturers' application notes
7. use relevant information on the Internet.

**Course content**

Two-port power gains. Power, available power, transducer power and unilateral power Stability. Stability circles, Roletts stability factor  
Conjugate matching and constant gain. Unilateral design and power gain design

Noise in microwave systems. Noise temperature, noise resistance and noise in cascaded systems

Low noise amplifiers. Unilateral design and available power gain design

Linearity aspects. P1dB, IMD, TOI and ACLR

Matching Networks. Lumped matching, Stub matching, matching and tapered lines

Bias Networks. Passive and active networks for BJT and FETs

Device Models. Linear models, non-linear models and Harmonic Balance

Oscillators, detectors and mixers

Diod detectors

RFICs, MICs and MMICs

**Teaching**

The education is performed in lectures, project, and laboratory work. An assignment is a major part of the course. In the assignment, part of a 5,2-GHz LAN is designed and evaluated. The laboratory work is normally performed in groups of three students. The project is conducted individually. Emphasis is put on the students ability 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.

**Prerequisites**

Passive Microwave Devices 7.5 cr or equivalent.

**Examination**

Written examination, laboratory exercises and project work.

**Grade**

A, B, C, D, E, Fx, F

**Limitations**

A written examination is offered at the end of the course. For each course two examination opportunities are offered: one at the end of the course and one extra. In addition, approved results from laboratory exercises and assignments are required. The report is marked with approval through the signature of the laboratory supervisor. In case of rejection, the report has to be revised by the student in agreement with the supervisors comments. For assignments, approved results are required.

**Other regulations**

Criteria for final grade will be given at the beginning of the course.

**Sustainable environment**

Content with sustainable development is not relevant to this course.

**Module**

0010	Written examination	4.5 cr	Grade: AF
0020	Assignment	0.6 cr	Grade: AF
0030	Project work	2.4 cr	Grade: AF