



HÖGSKOLAN I GÄVLE

RF Measurement Technology 7.5 cr

RF Mätteknik 7,5 hp

Set by Faculty of Engineering and Sustainable Development

Version

Set at

Valid from

10/11/13

HT2014

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| Level | G2F |
| Education level | First cycle |
| Course identifier | EEG503 |
| Credits | 7.5 cr |
| Main field of study | Electronics |
| Subject group | Electronics |
| Disciplinary domain | Technology 100.0 % |

Learning outcomes

The aim of the course is to give a systematic introduction to the fundamental components used in RF measurement systems, as well as to give in-depth knowledge of the most commonly occurring RF instruments.
Furthermore the course gives an understanding of the different causes of measurement uncertainty, and how they can be quantified. An understanding on how to minimize the effects of measurement error is given, in order to simultaneously to streamline measurements with respect to both time and cost.

Knowledge and understanding

After completion of the course the student shall be able to

1. state fundamental concepts within radio measurement technology
2. identify and explain what effects the choice of material has for the functioning of different components
3. use the relationship between reflection, return loss and impedance
4. state general radio measuring instruments and their applications
5. state the underlying mechanisms of measurement uncertainties in radio measurements and apply the knowledge to minimize these
6. state different measurement methods and their influence on the measurement results.

Skills and abilities

After completion of the course the student shall be able to

7. analyze key parameters and choose the right components to meet a given specification
8. analyze different measurement problems and, based on the analysis select the appropriate method
9. evaluate a measurement system starting from a given measurement task
10. use different radio measuring instruments
11. document and report experimental results in writing.

Values and attitudes

After completion of the course the student shall be able to

12. state the importance of care in measurements and documentation of these to minimize the risk of measurement errors and misinterpretations
13. reduce the risk of misinterpretation by critically examining the results from simulations and measurements.

Course content

A Radio Measurement System:

Basic parameters (characteristic impedance, standing wave ratio (VSWR), intermodulation, compression, harmonic and non-harmonic distortion, noise, phase noise etc.)

The Components of the Measurement System:

Coaxial cables and connectors

Attenuators and terminations

Filters

Coaxial switches and relays

Combiners and power splitters

Directional couplers

Circulators and isolators

Amplifiers

RF Probes

Mixers

Instrumentation for Radio Measurements:

Signal Generation (Signal generators for different applications)

Measuring Power (Power meters and measuring receivers)

Spectrum analysis (super heterodyne receivers, FFT analyzers)

Network analysis (s-parameters, calibration etc.)

Teaching

Instruction consists of lectures, exercises and laboratory work/assignments. The laboratory work/assignments are normally carried out in groups of two students. Particular emphasis is placed on the student's ability to conduct and document the work. Lectures and exercises are not compulsory for the student; however, participation in laboratory work / assignments is compulsory.

Prerequisites

B.Sc. degree in Electronics, Electrical Engineering or equivalent.
or

Courses corresponding to Signals and systems 15 hp and its prerequisites.

Examination

Written examination

Laboratory exercises

Grade

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

Limitations

For each course includes an ordinary exam and a second attempt.

Laboratory work and assignments require a pass mark from Lab supervisors and course coordinator respectively.

Lab reports must be submitted within two weeks after the scheduled laboratory session unless otherwise announced. Delayed reports will be dealt with at next time the course is given (normally one year later). In the event that a report is rejected, it must be revised by the student in accordance with the instructions of the lab supervisor.

For assessment of assignments the deadline is communicated by the examiner.

Sustainable environment

A minor part of the course content deals with sustainable development.

Module

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| 0010 | Written examination | 4.5 cr | Grade: AF |
| 0020 | Laboratory exercises | 3 cr | Grade: UG |