Course Handbook Electrical Engineering

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Electrical Engineering - mandatory courses (overview)

Title of module	Code	Semester	Learning and teaching methods	ECTS	Module convenor

(0 modules)

Electrical Engineering - optional courses (overview)

Title of module	Code	Semester	Learning and teaching methods	ECTS	Module convenor
English Communications Skills for Engineering Professionals (B)	E1840	-	2V	2	Prof. Dr. Christine Sick
Formal Methods in Telecommunications	E1983	-	2V+2U	5	Prof. Dr. Reinhard Brocks
Numerical Methods II	E1921	-	1V+1U	3	Prof. Dr. Wolfgang Langguth
Partial Differential Equations and Function Theory	E1920	-	2V+2U	5	Prof. Dr. Wolfgang Langguth
Statistics II	E1922	-	1V+1U	3	Prof. Dr. Barbara Grabowski

(5 modules)

Electrical Engineering - mandatory courses

Electrical Engineering - optional courses

English Communications Skills for Engineering Professionals (B)

Title of module: English Communications Skills for Engineering Professionals (B)
Degree programme: Electrical Engineering, Master, ASPO 01.10.2013
Code: E1840
Learning and teaching methods: 2V (2 hours per week)
ECTS credits: 2
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment:
Degree prog. incorporating this module: BMT1840 Biomedical Engineering, Master, ASPO 01.04.2014, optional course E1840 Electrical Engineering, Master, ASPO 01.10.2013, optional course, non-technical
Total student study time: 30 class contact hours over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 30 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisite skills/modules: None.

Recommended as prerequisite for:
Module convenor: Prof. Dr. Christine Sick
Teaching staff: Prof. Dr. Christine Sick [*updated 14.10.2015*]
Learning outcomes/skills: [*still undocumented*]
Outline content: [*still undocumented*]
Reading list: [*still undocumented*]

Formal Methods in Telecommunications

Title of module: Formal Methods in Telecommunications
Degree programme: Electrical Engineering, Master, ASPO 01.10.2013
Code: E1983
Learning and teaching methods: 2V+2U (4 hours per week)
ECTS credits: 5
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Written examination
Degree prog. incorporating this module: E1983 Electrical Engineering, Master, ASPO 01.10.2013, optional course, technical KI715 Computer Science and Communication Systems, Master, ASPO 01.10.2010, semester 7, mandatory course PIM-WN15 Applied Informatics, Master, ASPO 01.10.2011, semester 7, optional course, not informatics specific
Total student study time: 60 class contact hours over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 90 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisite skills/modules: None.
Recommended as prerequisite for:

Module convenor:
Prof. Dr. Reinhard Brocks

Teaching staff: Prof. Dr. Reinhard Brocks
[*updated 15.10.2015*]

Learning outcomes/skills:
Students will acquire an understanding of how communication protocols function. They will be able to specify services and protocols using formal descriptive languages and will be able to deploy protocol development tools.
[*updated 08.05.2008*]

Outline content:
The principles of communication protocols, communication instances and how they function
Message Sequence Charts (MSCs):

- Basic language constructs (Frame, Instance, Message, Condition, Action, Timer, Create)
- Structural language constructs (Coregion, Decomposition, References, Inline expressions, High-level MSC)

Specification and Description Language (SDL):

- Agents
- Process specification
- Transmitting and receiving signals
- Timers
- Procedures

Abstract Syntax Notation One (ASN.1):

- Abstract, concrete and transfer syntax
- Presentation context
- Object identifiers
- Module structure
- Simple and compound types
- Tagging
- BER encoding rules

Testing and Test Control Notation (TTCN-3):

- Protocol development
- Protocol testing

[*updated 08.05.2008*]

Reading list:

Textbooks

- König, Hartmut: Protocol Engineering, Teubner 2003, ISBN 3-519-00454-2

Specialist literature

- Dubuisson, Olivier: ASN.1, Communication between heterogeneous systems, Morgan Kaufmann, 2001, ISBN 0-12-633361-0, http://asn1.elibel.tm.fr/en/book/
- Ellsberger, Hogrefe, Sarmen: SDL: Formal Object-Oriented Language for Communicating Systems, 1997
- Mitschele-Thiel: Systems Engineering with SDL, John Wiley & Sons, 2001

Specifications

- ITU-T Recommendation Z.120 : Message Sequence Charts (MSC), 2004
- ITU-T Recommendation Z.100: Specification and Description Language SDL, 2002
- ITU-T Recommendation Z.140: Testing and test control notation version 3 (TTCN-3): Core language, 2003

Lecture notes

- Brocks, R.: Lecture notes

Websites

- http://www.itu.int : International Telecommunication Union
- http://asn1.elibel.tm.fr/ : ASN.1 Information Site
- http://www.sdl-forum.org/ : SDL-Forum Society
- http://www.iec.org/ : International Engineering Consortium
- http://www.oss.com/ : OSS Nokalva

[*updated 08.05.2008*]

Numerical Methods II

Title of module: Numerical Methods II
Degree programme: Electrical Engineering, Master, ASPO 01.10.2013
Code: E1921
Learning and teaching methods: 1V+1U (2 hours per week)
ECTS credits: 3
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Written examination
Degree prog. incorporating this module: E935 Electrical Engineering, Master, ASPO 01.10.2005, semester 9, optional course E1921 Electrical Engineering, Master, ASPO 01.10.2013, optional course, technical
Total student study time: 30 class contact hours over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 60 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisite skills/modules: None.
Recommended as prerequisite for:
Module convenor: Prof. Dr. Wolfgang Langguth

Teaching staff: Prof. Dr. Wolfgang Langguth
[*updated 14.10.2015*]

Learning outcomes/skills:
Numerical methods play a major role in engineering degree courses and in the field of electrical and electronic engineering in particular, where they are used in the analysis of signals and measurement data. This module builds on the basic numerical methods course (E806: Higher Mathematics II Numerical Methods and Statistics) and aims to teach students more advanced numerical methods. By undertaking small-scale projects students will learn how to use numerical methods to plan and solve problems.
After completing this module, students will be able to solve the sort of complex numerical problems that arise in communications engineering and automation engineering either working individually or in collaboration with mathematicians.
[*updated 13.03.2010*]

Outline content:
Orthogonal polynomials
1.Numerical integration
2.Integral equations
3.Non-linear equations
4.Least-squares methods, Fourier series and the Fourier transform
5.Eigenvalue problems
[*updated 13.03.2010*]

Teaching methods/Media:
Blackboard, overhead projector, video projector, lecture notes (planned)
[*updated 13.03.2010*]

Reading list:
SCHWARZ: Numerische Mathematik, Teubner, 1993
Scheid: Numerische Analysis, Schaum, 1991
PRESS et al.: Numerical Recipes, Cambridge Press, 1987
STOER: Einführung in die Numerische Mathematik I und II, Springer, 1972
Schwetlick, Kretschmar: Numerische Verfahren für Naturwissenschaftler und Ingenieure, Fachbuchverlag Leipzig, 1991
SCHABACK, WERNER: Numerische Mathematik, Springer, 1992
KOSE, SCHRÖDER, WIELICZEK: Numerik sehen und verstehen, Vieweg, 1992
BRONSTEIN, SEMENDJAJEW, MUSIOL, MÜHLIG: Taschenbuch der Mathematik, Deutsch 2000
STÖCKER: Taschenbuch der Mathematik, Harri Deutsch Verlag, Frankfurt
[*updated 13.03.2010*]

Partial Differential Equations and Function Theory

Title of module: Partial Differential Equations and Function Theory
Degree programme: Electrical Engineering, Master, ASPO 01.10.2013
Code: E1920
Learning and teaching methods: 2V+2U (4 hours per week)
ECTS credits: 5
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Written examination
Degree prog. incorporating this module: E934 Electrical Engineering, Master, ASPO 01.10.2005, semester 9, optional course E1920 Electrical Engineering, Master, ASPO 01.10.2013, optional course, technical
Total student study time: 60 class contact hours over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 90 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisite skills/modules: None.
Recommended as prerequisite for:
Module convenor: Prof. Dr. Wolfgang Langguth

Teaching staff: Prof. Dr. Wolfgang Langguth
[*updated 14.10.2015*]

Learning outcomes/skills:
After successfully completing this course, students will be in a position to analyse complex problems in electrical and electronic engineering and to apply the knowledge and skills acquired to rapidly familiarize themselves with new areas and problems in electrical and electronic engineering.
[*updated 13.03.2010*]

Outline content:
1.Partial differential equations
1.1.Hyperbolic differential equations
1.2.Parabolic differential equations
1.3.Elliptical differential equations

2.Introduction to the theory of functions of complex variables
2.1.Complex functions
2.2.Differentiation
2.3.Integration
2.4.Series expansion, residue theorem
[*updated 13.03.2010*]

Teaching methods/Media:
Blackboard, overhead projector, video projector, lecture notes (planned)
[*updated 13.03.2010*]

Reading list:
DALLMANN, ELSTER: Einführung in die höhere Mathematik III, Gustav Fischer, 1991
DIRSCHMID: Mathematische Grundlagen der Elektrotechnik, Vieweg, 1990
Burg, Haf, Wille: Höhere Mathematik für Ingenieure, Teubner
BRONSTEIN, SEMENDJAJEW, MUSIOL, MÜHLIG: Taschenbuch der Mathematik, Deutsch 2000
STÖCKER: Taschenbuch der Mathematik, Harri Deutsch Verlag, Frankfurt
[*updated 13.03.2010*]

Statistics II

Title of module: Statistics II
Degree programme: Electrical Engineering, Master, ASPO 01.10.2013
Code: E1922
Learning and teaching methods: 1V+1U (2 hours per week)
ECTS credits: 3
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Written exam and small-scale project
Degree prog. incorporating this module: E938 Electrical Engineering, Master, ASPO 01.10.2005, semester 9, optional course E1922 Electrical Engineering, Master, ASPO 01.10.2013, optional course, technical MST.STA Mechatronics and Sensor Technology, Master, ASPO 01.04.2016, optional course, technical MST.STA Mechatronics and Sensor Technology, Master, ASPO 01.10.2011, optional course, technical
Total student study time: 30 class contact hours over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 60 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisite skills/modules: None.
Recommended as prerequisite for:

Module convenor:
Prof. Dr. Barbara Grabowski

Teaching staff: Prof. Dr. Barbara Grabowski
[*updated 14.10.2015*]

Learning outcomes/skills:
Statistical methods play a major role in engineering degree courses and in the field of electrical and electronic engineering in particular. These methods are important when designing experiments and analysing and evaluating observation data, as well as for modelling, simulating and optimizing processes, and when attempting to identify and model interdependencies.
This course builds on the basic course on probability calculus (E806: Higher Mathematics II Numerical Methods and Statistics) and aims to teach students more advanced statistical methods. By undertaking small-scale projects students will learn how to use a statistical computing programming language (such as R) to plan and solve complex problems involving extensive amounts of data.
After completing this module, students will be able to solve the sort of complex statistical problems that arise in communications engineering and automation engineering either working individually or in collaboration with mathematicians.
[*updated 13.03.2010*]

Outline content:
1.Statistical interference techniques
1.1Hypothesis testing
1.2Testing statistical distributions
2.Generating random numbers
3.Stochastic processes
(Definition, classification, covariance function and spectral density, cross-correlation function, stationarity, ergodicity)
4.Markov chains and their application in coding and information theory
5.The Poisson process
6.Markov processes
7.Birth and death processes
8.Introduction to queuing theory
9.Introduction to the simulation of discrete systems
10.Small-scale projects
11.Stochastic signals

Further/Other topics that may be addressed include:

12.Introduction to further statistical methods
Regression and correlation analysis
Variance analysis
Small-scale projects
[*updated 13.03.2010*]

Teaching methods/Media:
Blackboard, overhead projector, video projector, lecture notes, PC
[*updated 13.03.2010*]

Reading list:
B.Grabowski: ActiveMath:Statistik: Statistik für Ingenieure technischer Fachrichtungen an Fachhochschulen - e-Learning-Buch,
H.Weber: Einführung in die Wahrscheinlichkeitsrechnung und Statistik für Ingenieure
B.Grabowski: Lexikon der Statistik, Elsevier-Verlag, 2001
B.Grabowski: Stochastik, Lehrmaterial für das Fernstudium, Zentralstelle für Fernstudien an Fachhochschulen, ZFH Koblenz, 2004.
B.Grabowski: Die Simulationssprache AWESIM, Lehrmaterial für das Fernstudium, Zentralstelle für Fernstudien an Fachhochschulen , ZFH Koblenz, 2000.
B.Grabowski: Mathematische Methoden bei der Simulation diskreter Systeme,
Lehrmaterial für das Fernstudium, Zentralstelle für Fernstudien an Fachhochschulen , ZFH Koblenz, 2000.

Material available at www.htw-saarland.de/fb/gis/mathematik:
1) Lecture notes I and II (internet)
2) Formula sets 1 and 2 to lecture notes I and II
3) Exercises and worked solutions to problems in lecture notes I and II
4) Online e-learning server ACTIVEMATH
[*updated 13.03.2010*]