Prüfungsordnung
des Fachbereichs 2 – Informatik und Ingenieurwissenschaften der Fachhochschule Frankfurt am Main – University of Applied Sciences für den Master-Studiengang Information Technology vom 30.05.2007

Aufgrund des § 50 Abs. 1 Nr. 1 des Hessischen Hochschulgesetzes (HHG) in der Fassung vom 31. Juli 2000 (GVB1.I S. 374), zuletzt geändert durch Gesetz vom 18.Dezember 2006 (GVBL. I S. 713), hat der Fachbereichsrat des Fachbereichs 2: Informatik und Ingenieurwissenschaften der Fachhochschule Frankfurt am Main – University of Applied Sciences am 30.05.2007 die nachstehende Prüfungsordnung für den Master-Studiengang Information Technology beschlossen. Die Prüfungsordnung entspricht den Allgemeinen Bestimmungen für Prüfungsordnungen mit den Abschlüssen Bachelor und Master an der Fachhochschule Frankfurt am Main – University of Applied Sciences (AB Bachelor/Master) vom 10. November 2004 (Staatsanzeiger für das Land Hessen 2005 S. 519) und ergänzt die Allgemeinen Bestimmungen.
Nach § 94 HHG hat der Präsident der Fachhochschule Frankfurt am Main – University of Applied Sciences die Prüfungsordnung am 17.07.2007 genehmigt. Die Genehmigung ist befristet für die Dauer der Akkreditierung bis zum 30.09.2012.

§ 1
Studienziel, Akademischer Grad

(1) Das Studium qualifiziert für eine berufliche Tätigkeit mit Übernahme von Projekt- und Führungsverantwortung als Ingenieurin oder Ingenieur in der Informationstechnik sowie für ein Promotionsstudium.
(2) Nach bestandener Master-Prüfung verleiht die Fachhochschule Frankfurt am Main – University of Applied Sciences den akademischen Grad **Master of Engineering (M. Eng.)**.
(3) Der Master-Studiengang ist vom Profiltyp als stärker anwendungsorientierter Studiengang konzipiert. Näheres ergibt sich aus dem Diploma Supplement.
(4) Der Master-Abschluss eröffnet den Zugang zum Höheren Dienst.

§ 2
Regelstudienzeit, ECTS-Punkte (Credits)

(1) Die Regelstudienzeit beträgt vier Semester.
(2) Das gesamte Studium umfasst 120 ECTS-Punkte (Credits).

§ 3
Zulassungsvoraussetzungen und Zulassungsverfahren

Voraussetzungen für eine Immatrikulation sind:

1. Ein erster berufsqualifizierender Hochschulabschluss in Elektrotechnik und Informationstechnik oder einem vergleichbaren Fachgebiet. Das Studium muss mindestens mit der Gesamtnote "gut" abgeschlossen worden sein. Bei ausländischen Vorbildungsnachweisen gilt die Satzung über das Verfahren der Bewerbung und Zulassung

von Studienbewerberinnen und Studienbewerbern mit ausländischen Vorbildungsnachweisen an der Fachhochschule Frankfurt am Main vom 28. Februar 2005.

2. Der Prüfungsausschuss kann maximal 20 Prozent der Studienplätze an Bewerberinnen oder Bewerber mit einer anderen Gesamtnote vergeben, wenn sie ihre besondere Qualifikation durch eine erfolgreiche, mindestens dreijährige Ingenieurtätigkeit nach dem ersten Studienabschluss nachweisen. Der Nachweis der besonderen Qualifikation kann über Arbeitsberichte, Fachaufsätze, Tagungsbeiträge, Patentschriften und Ähnliches erfolgen.
3. Nachweislich gute Kenntnisse der englischen Sprache. Der Prüfungsausschuss beschließt über Art und Umfang des Nachweises in Orientierung an der Satzung über das Verfahren der Bewerbung und Zulassung von Studienbewerberinnen und Studienbewerbern mit ausländischen Vorbildungsnachweisen an der Fachhochschule Frankfurt am Main vom 28. Februar 2005.

§ 4
Module

(1) Der Studiengang umfasst 19 Module.

(2) Die Inhalte der Module, die Anzahl der jeweiligen ECTS-Punkte (Credits) sowie die Art und Dauer der jeweiligen Prüfungsleistungen ergeben sich aus der Modultafel (Anlage 1) und den Modulbeschreibungen (Anlage 2).

(3) Die Zulassung zum Modul 19 Master-Thesis mit Kolloquium setzt den erfolgreichen Abschluss der Module 1 bis 18 voraus.

§ 5
Wiederholung von Prüfungsleistungen

Nicht bestandene Modulprüfungsleistungen können zweimal wiederholt werden.

§ 6
Master-Thesis

(1) Die Master-Thesis (Modul 19: Master-Thesis mit Kolloquium) umfasst 30 ECTS-Punkte (Credits).

(2) Die Bearbeitungszeit der Master-Thesis beträgt fünf Monate. Die Bearbeitungszeit kann auf schriftlichen Antrag der Kandidatin oder des Kandidaten aus Gründen, die sie oder er nicht zu vertreten hat, von der oder dem Vorsitzenden des Prüfungsausschusses einmal verlängert werden, höchstens jedoch um zwei Monate.

(3) Die Master-Thesis (Modul 19: Master Thesis mit Kolloquium) ist in Schriftform in zwei gedruckten Exemplaren und zusätzlich in elektronischer Form auf einem geeigneten Datenträger im Prüfungsamt abzuliefern.

(4) Die Master-Thesis ist in englischer Sprache abzufassen. Sie kann in begründeten Fällen auf Antrag auch in deutscher Sprache verfasst werden.

§ 7
Gesamtnote

(1) Die Gesamtnote der Masterprüfung wird gebildet aus:

1. dem arithmetischen Mittel der Noten der Modulprüfungen der Module 1 bis 18
2. der Note des Moduls Master-Thesis mit Kolloquium

mit der Gewichtung von sieben zu drei.

(2) Entsprechend § 14 Abs. 5 der AB Bachelor/Master wird für die Gesamtnote der Bachelor-Prüfung auch ein ECTS-Rang vergeben.

§ 8
Zeugnis

(1) Das Zeugnis über die Masterprüfung enthält die Modulnoten, das Thema der Master-Thesis, die Anzahl der erworbenen ECTS-Punkte (Credits) und die Gesamtnote der Masterprüfung.

(2) Zusätzlich zum Zeugnis wird ein Diploma Supplement gemäß Anlage 4 ausgegeben.

§9
In-Kraft-Treten

Die Prüfungsordnung tritt am 01.09.2007 zum Wintersemester 2007/2008 in Kraft.

Frankfurt am Main, den 1.10.09

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Prof. Dr.-Ing. M. Hefter, Dekan Fb 2

Anlagen

1. Modulübersicht
2. Modultafel
3. Modulbeschreibungen
4. Diploma Supplement

Modulübersicht zum Master-Studiengang Information Technology

Modulnummern in Klammern

1. Semester	2. Semester	3. Semester	4. Semester
Vector Analysis (1)	Digital Baseband Transmission and Modulation Methods (6)	Mobile Computing (8)	Master Thesis and Colloquium (19)
Stochastic Signals and Systems (2)	Distributed Systems and Computer Networks (7)	Engineering of Optical and Microwave Communication Systems and Laboratory (11)	
Methods, Systems and Networks for Digital Communication (3)	Digital Switching and Routing (9)	Automation Laboratory (13)	
Circuit Design for Communication Systems (4)	Field Theory for Optical and Microwave Communication Systems (10)	Computational Intelligence (14)	
Software Engineering (5)	Image Processing and Identification of Dynamic Systems (12)	Intelligent Sensors Technology (15)	
International Project Management and Business Administration (17)	Optional Technical Subject (16)	Project (18)	

Modultafel des Master-Studienganges Information Technology

	1. Semester	2. Semester	3. Semester	4. Semester
1. Modul: Vector Analysis	5/4			
2. Modul: Stochastic Signals and Systems	5/4			
3. Modul: Methods, Systems and Networks for Digital Communication	5/4			
4. Modul: Circuit Design for Communication Systems	5/4			
5. Modul: Software Engineering	5/3			
6. Modul: Digital Baseband Transmission and Modulation Methods		5/4		
7. Modul: Distributed Systems and Computer Networks		5/4		
8. Modul: Mobile Computing			5/3	
9. Modul: Digital Switching and Routing		5/3		
10. Modul: Field Theory for Optical and Microwave Communication Systems		5/4		
11. Modul: Engineering of Optical and Microwave Communication Systems and Laboratory			5/3	
12. Modul: Image Processing and Identification of Dynamic Systems		5/5		
13. Modul: Automation Laboratory			5/2	
14. Modul: Computational Intelligence			5/4	
15. Modul: Intelligent Sensors Technology			5/3	
16. Modul: Optional Technical Subject		5/2		
17. Modul: International Project Management and Business Administration	5/4			
18. Modul: Project			5/2	
19. Modul: Master Thesis mit Kolloquium				30/6
Summe ECTS/SWS	**30/23**	**30/22**	**30/17**	**30/6**

Modul 1: Vector Analysis	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	By the end of the course, students are able to: Calculate scalar and vector products. Find the vector equations of lines and planes Understand the idea of the angular velocity vector of a rigid body and how to use this to find the velocity of points on the body. Understand the parametric equations of curves and surfaces. Differentiate vector functions of a single variable. Calculate velocity and acceleration vectors for moving particles. Understand and be able to find the unit tangent vector, the unit principal normal and the curvature of a space curve. Find the gradient of a function. Find the divergence and curl of a vector field Use the gradient operator to calculate the directional derivative of a function. Calculate the unit normal at a point on a surface. Evaluate line and surface integrals. Understand the various integral theorems relating line, surface and volume integrals.
Contents	Definition of vectors, addition and subtraction of vectors, scalar product and vector product, unit vectors. Representation of vectors, scalar- and vector product in rectangular coordinates. Differential geometry of lines, vector functions and their geometrical interpretation, differential calculus of vectors, lines, arc length, curvature and torsion, cylindrical coordinates and spherical coordinates. Scalar fields and vector fields, gradients, divergence and curl of vector fields and their physical interpretations, nabla-operator and his representation in different coordinate systems, line, surface and volume integrals; Theorems of Gauss, Stokes and Green and their physical interpretation
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 2: Stochastic Signals and Systems	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the course the student will have a thorough understanding of the mathematical presentation of Random Variables and Random Processes and will be able to perform mathematical design of systems utilizing random signals
Contents	Statistic and Axiomatic presentation of Probability, Random Variables, Probability Distributions, Probability Density, Ensemble Average, Variance, Covariance, Moments, Correlation Coefficient. Definition and Examples of Random Processes, Correlation Functions, Spectral Density, Stationary Processes, Instationary Processes. Transformation of Distributions and Density Functions, Transformation of Moments, Transformation of Ensemble Average, Transformation of Autocorrelation Functions, Transformation of Spectral Densities, Applications.
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 3: Methods, Systems and Networks for Digital Communication	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the student will have a thorough understanding of the functionalities and architectures of modern telecommunication systems and networks. He will be able to analyse different network technologies and to specify network nodes and architectures.
Contents	Fundamentals – Multiplexing mechanisms, communication methods, switching and routing principles. Protocols – OSI reference model, protocols and description methods. Telecommunication networks – Transport, ISDN, Access, LAN, Internet, GSM/UMTS, Next Generation Networks. Network Management
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 4: Circuit Design for Communication Systems	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	By the end of the course, students are able to understand the underlying technology of communication systems. to compare technical solutions for their merits in terms of functional and non-functional requirements, within the domain of communication systems. to select and apply suitable techniques of analysis and design to develop a good technical solution. to exercise professional responsibility in designing and assessing the effectiveness of solutions developed.
Contents	Overview of communication systems, standards, frequencies and circuit technologies. Transmission line theory and scattering parameters. Amplifier design, low-noise amplifier, power amplifier. Mixer design, semiconductor devices for mixers, diode mixers, FET-mixers. Frequency synthesizer design, voltage controlled oscillators, phase lock-loop design, implementations of PLLs. Wireless communication applications, transceiver requirements, amplifier, mixer, filter and synthesizer requirements. Examples of radio frequency ICs
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 5: Software Engineering	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Project Work (Processing time: 1 semester)
Educational objectives/ Capabilities	On successful completion of the course the student will be familiar with software engineering techniques. He/she will have achieved the ability to perform software projects and to manage software development teams.
Contents	This course covers the entire software development life-cycle including planning, requirements analysis, requirements specification, and design. Emphasis is placed on advanced topics including prototyping, verification and validation, formal methods, and quality management. A major component is an excercise project that utilizes a Computer Assisted Software Engineering (CASE) tool to assist in the analysis, design, and implementation of a system.
Types of courses	Lectures and project
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 6: Digital Baseband Transmission and Modulation Methods	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the student will have a thorough understanding of the methods of digital baseband transmission and modulation techniques for transmission systems. He will be able to specify the system architecture, the hardware and the software structure of transmission nodes.
Contents	Digital baseband transmission - pulse shaping, eye-diagram, Nyquist criteria, special filters, line coding. Modulation - amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), continuous phase frequency shift keying (CPFSKK), amplitude phase shift keying (APK), continuous phase modulation (CPM), xDSL.
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 7: Distributed Systems and Computer Networks	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the Student achieves the ability to analyze, design, validate and operate distributed systems and computer networks.
Contents	Fundamentals - Hardware and software concepts, operating systems, file systems, applications. Communication - OSI reference model, protocols, client-server model, RPC, group communication. Synchronization and processes - clock synchronization, mutual exclusion, atomic transactions, deadlocks, algorithms, system models, processor allocation. Distributed file systems - Design, implementation, applications. Selected special topics - Distributed agents, grid computing, security.
Types of courses	Lectures
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 8: Mobile Computing	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Project Work (Processing time: 1 semester)
Educational objectives/ Capabilities	On successful completion of the subject the student will have a thorough understanding of the requirements and solutions of telecommunication networks regarding to subscriber mobility and heterogeneous network infrastructure. He will be able to analyse and develop protocols, network nodes and networks. In addition the student will have the ability to plan and to give a presentation.
Contents	Telecommunication networks – ISDN, Internet, cellular mobile networks, multimedia communication, mobility, personalized services. Mobile communication – Fundamentals, examples. Support of mobility in packet-based networks – Mobile IP, localization, routing, handover, roaming, upper layers. UMTS – architecture, interfaces, protocols, services. Fixed mobile convergence. Multimedia in IP-networks – VoIP, Quality of Service, H.323, SIP. Internetworking in heterogeneous networks. Gateways and control. Mobile Computing und Next Generation Networks – Architectures, applications, security.
Types of courses	Lectures and project
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 9: Digital Switching and Routing	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	Laboratory confirmation
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the student will have a thorough understanding of the development, planning and operating of switching and routing systems. He will be able to analyse, to specify and to develop protocols and network nodes for switching and routing.
Contents	Protocols - HDLC, DSS1, signalling system no.7, TCP/IP, routing protocols. Switching and routing - 64 kbit/s, IP, ATM, Multiprotocol Label Switching (MPLS). Quality of Service. Traffic handling theory
Types of courses	Lectures combined with exercises and laboratory
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 10: Field Theory for Optical and Microwave Systems	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	By the end of the course, students are able to: explain Maxwell's Equations formulate all boundary conditions formulate and solve the wave equation of a plane wave classify different wave solutions explain the modes of rectangular and circular waveguides find solutions of a dielectric slab waveguide explain the weakly guided solutions of cylindrical optical waveguides
Contents	Microwave and optical Systems, Introduction, the electromagnetic spectrum, History and uses of microwave and optics, Communication systems, Radar and Lidar systems, Remote sensing systems Electromagnetic theory, Maxwell's equations, Constitutive relations, Static fields, Maxwell's equation in the frequency domain, the electromagnetic wave equation, Power in the electromagnetic wave and the Poynting vector, Boundary conditions, Plane Waves, Reflections from a conducting plane, a dielectric interface Guided Waves, Classification of wave solutions, Fields of TEM, TM and TE Modes Microwave waveguides, Microwave transmission lines, Rectangular waveguide, Circular waveguide, Other waveguide types, Waveguide components Optical Wavequides, Principles of dielectric waveguides, Dielectric slab waveguide, Optical fibres, Modes in cylindrical optical waveguides, Transmission losses in optical fibres, Signal distortion due to dispersion Antennas, Purpose of antennas and types, Basic antenna properties, Radiation from apertures Moment Method
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 11: Engineering of Optical and Microwave Systems	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Project Work (Processing time: 1 semester)
Educational objectives/ Capabilities	Qualification to do independent work in electromagnetic field theory in the domain of optics and microwaves. Gain knowledge of different system architectures in the field of optics and microwave. Understanding the design process and the requirements of the selected system architectures.
Contents	Modulation and noise behaviour of semiconductor lasers and photo detectors. System architecture of different optical and microwave systems e.g. Wireless LANs, Optical LANs. Component requirements to design and build the physical layers Projects on optical and microwave systems.
Types of courses	Lectures and project
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 12: Image Processing and Identification of Dynamic Systems	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject image processing the student will have a thorough knowledge in image processing. He/she will be able to plan and operate image processing and real world conditions. On successful completion of the unit identification of dynamic systems the student has got an inside view of system identification and classification methods. He/she will be able to use basic methods of signal and process modelling to detect faults, failures and malfunctions. He will be able to work with fault diagnosis systems using a basic knowledge of classification methods.
Contents	Image Processing: Modelling illumination and imaging, image transfer function, spatial resolution, contrast enhancement through illumination, optics, camera technology, image acquisition, image memory, image processing hardware, pattern recognition algorithms for image processing Identification of Dynamic Systems: Theoretical and experimental modelling of dynamic systems, system identification using discrete deterministic and discrete stochastic signals, least-squares estimation, tasks and terminology of supervision and fault management of processes, fault models, discrete time dynamic process models, signal models, fault detection with signal models, fault detection with process identification models, fault diagnosis with classification methods
Types of courses	Lectures combined with exercises
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 13: Automation Laboratory	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Laboratory documentation (Processing time: 20h)
Educational objectives/ Capabilities	Qualification to do independent practical work on intelligent systems in automation. The student will be able to analyse, to specify and to develop intelligent systems for automation tasks.
Contents	Laboratory projects on intelligent systems in automation
Types of courses	Laboratory
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 14: Computational Intelligence	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the student will have a thorough understanding in the theory of computational intelligence. He will be able to analyse computation problems, to develop strategies and algorithms for a solution and to specify the respective hardware and software structure.
Contents	Approaches and structures of artificial neural networks and fuzzy systems, an additional topic like quantum computing, swarm intelligence, human-centric systems or granular systems, pattern recognition systems, learning strategies and algorithms, applications
Types of courses	Lectures
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 15: Intelligent Sensors Technology	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Project Work (Duration 1 Semester)
Educational objectives/ Capabilities	The student will have a thorough knowledge regarding hardware and software of intelligent sensors and the application of algorithms for the analysis of signals and patterns
Contents	Intelligent Sensors Technology: Technology and application of sensor elements for different signal sources, technology and characteristics of microcontroller for intelligent sensors, design of intelligent sensors, programming of algorithms for signal processing and pattern recognition, examples of intelligent sensors for different applications, sensor networks, sensor fusion. Projects regarding design, programming and application of intelligent sensors.
Types of courses	Lectures and project
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 16, Alternative 1: Optional Technical Subject: Numerical Field Theory with C++	
Study programme	Information Technology (M.Eng.)
Applicability	In the study programme Information Technology (M.Eng.) only
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Oral Examination (Duration: at least 15 minutes and maximum 45 minutes)
Educational objectives/ Capabilities	The students are able to act with cooperative effort and they are also able to recognize scientific, technical and economical aspects of a multilayered topic, and to balance reasons in an integrated manner.
Contents	Depending on the subject of the seminar
Types of courses	Seminar
Total workload (h)	150
Language	English
Frequency	Every summer semester

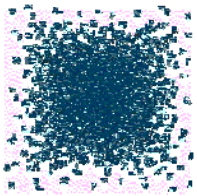
Modul 16, Alternative 2: Optional Technical Subject: Modern Control Theory	
Study programme	Information Technology (M.Eng.)
Applicability	In the study programme Information Technology (M.Eng.) only
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Oral Examination (Duration: at least 15 minutes and maximum 45 minutes)
Educational objectives/ Capabilities	The students are able to act with cooperative effort and they are also able to recognize scientific, technical and economical aspects of a multilayered topic, and to balance reasons in an integrated manner.
Contents	Depending on the subject of the seminar
Types of courses	Seminar
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 16, Alternative 3: Optional Technical Subject: Digital Control System Design	
Study programme	Information Technology (M.Eng.)
Applicability	In the study programme Information Technology (M.Eng.) only
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Oral Examination (Duration: at least 15 minutes and maximum 45 minutes)
Educational objectives/ Capabilities	The students are able to act with cooperative effort and they are also able to recognize scientific, technical and economical aspects of a multilayered topic, and to balance reasons in an integrated manner.
Contents	Depending on the subject of the seminar
Types of courses	Seminar
Total workload (h)	150
Language	English
Frequency	Every summer semester

Modul 17: International Project Management and Business Administration	
Study programme	Information Technology (M.Eng.)
Applicability	Applicable in other electrical engineering and information technology master curricula
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Written examination (duration: 90 minutes)
Educational objectives/ Capabilities	On successful completion of the subject the student will have the ability to plan, organize and execute complex international technical projects and wil be familiarized with the structure and essential functions of operations
Contents	International Project Management: The nature of international business, specifics of international projects, activities until contract award, post award contract administration: project organization, project control, quality control, documentation, reports; technical project management from design to commercial operation Business Administration: Operations structure and functions, legal and regulatory environment, business planning, financing, cost accounting, industrial marketing, human resource management, ethics in business
Types of courses	Lectures
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 18: Project	
Study programme	Information Technology (M.Eng.)
Applicability	In the study programme Information Technology (M.Eng.) only
Duration	1 Semester
Credit Points (CP)	5
Pre-conditions for module participation	None
Pre-conditions for module examination	None
Module examination	Project Work (Processing time: 1 semester)
Educational objectives/ Capabilities	On successful completion of the subject the student will be able to do requirements engineering and to evolve problem solution strategies. He/she will be able to present technical projects.
Contents	Depending on the projects subject
Types of courses	Project
Total workload (h)	150
Language	English
Frequency	Every winter semester

Modul 19: Master Thesis and Colloquium	
Study programme	Information Technology (M.Eng.)
Applicability	In the study programme Information Technology (M.Eng.) only
Duration	1 Semester
Credit Points (CP)	30
Pre-conditions for module participation	Modules 1 through 18
Pre-conditions for module examination	None
Module examination	Master Thesis and colloquium. The Master Thesis is weighted 80 per cent and the colloquium ist weighted 20 per cent.
Educational objectives/ Capabilities	On successful completion of the master thesis the student aquires the ability to plan, organize, develop, operate and present all kinds of information technology systems due to real world requirements.
Contents	Depending on the master thesis subject
Types of courses	Individual thesis under supervision of a thesis advisor
Total workload (h)	900
Language	English, (German on authorization request)
Frequency	Every semester



Fachhochschule Frankfurt am Main -
University of Applied Sciences

Diploma Supplement

This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international „transparency" and fair academic and professional recognition of qualifications (diploma, degrees, certificates, etc.) . It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value judgements, equivalence statements or suggestions about recognition. Information in all sections should be provided. Where information is not provided, an explanation should give the reason why.

1. HOLDER OF THE QUALIFICATION

1.1 Family Name / 1.2 First Name

individuell

1.3 Date, Place, Country of Birth

individuell

1.4 Student ID Number or Code

individuell

2. QUALIFICATION

2.1 Name of Qualification / Titel Conferred (full, abbreviated; in original language)

Master of Engineering, M. Eng.

2.2 Main Field(s) of Study

Information Technology

2.3 Institution Awarding the Qualification (in original language)

Fachhochschule Frankfurt am Main - University of Applied Science

Department of Computer Science and Engineering

Status (Type / Control)

University of Applied Science / State Institution

2.4 Institution Administering Studies (in original language)

(same)

Status (Type / Control)

(same)

2.5 Language(s) of Instruction/Examination

English

3. LEVEL OF THE QUALIFICATION

Certification Date:

Chairperson Examination Committee

3.1 Level

Second Degree (2 years), including research by thesis

3.2 Official Length of Programm

2 years, 120 ECTS

3.3 Access Requirements

First Degree in Electrical Engineering or related subjects, or foreign equivalent

4. CONTENTS AND RESULTS GAINED

4.1 Mode of Study

Full time

4.2 Programme Requirements/ Qualification Profile of the Graduate

The programme includes 12 written exams, 1 oral exam, five supervised teamwork projects (5 CP), one semester (30 CP) Master Thesis (optionally in a company or state institution) and a concluding colloquium.

The graduate is competent and qualified to think in a multi- and interdisciplinary way when applying laws and principles of information technology in order to solve challenging and complex technical problems, particularly in reference to the development of new technologies, products, and services. The graduate acquired a wide knowledge base in mathematics and system theory, and in communication/information engineering. In addition, he/she has chosen optional technical subjects (5 CP).

The graduate owns profound specialist knowledge in the fields of information technology. He/she possesses skills and experiences in digital communication systems, optical and microwave systems or in intelligent systems, intelligent sensors and pattern recognition.

The graduate is able to apply modern project management and business administration methods. He/she has at his/her disposal key competences in technical English, in social interaction (team work, project work) and in professional presentation and communication. He/she is prepared for life long learning, and will be able to obtain higher academic degrees.

4.3 Programme details

See “Transcript of records” for list of courses and grades, and “Prüfungszeugnis” (Final Examination Certificate) for subjects offered in final examinations (written and oral), and topic of thesis, including evaluations.

4.4 Grading Scheme

General grading scheme cf. Sec. 8.6 – In addition, institutions already use the ECTS grading scheme which operates with the levels A (best 10%), B (next 25%), C (next 30%), D (next 25%), E (next 10%).

4.5 Overall Classification (in original language)

Individuell: sehr gut; gut; befriedigend; ausreichend

Based on the accumulation of grades received during the study programme and the final thesis.

cf. Prüfungszeugnis (Final Examination Certificate)

Certification Date:

Chairperson Examination Committee

5. FUNCTION OF THE QUALIFICATION

5.1 Access to Further Study

Qualifies to apply for admission for doctorate studies

5.2 Professional status

The degree entitles the holder for higher engineering and management functions in companies and private or state institutions.

6. ADDITIONAL INFORMATION

6.1 Additional Information

6.2 Further information sources

On the institution: www.fh-frankfurt.de

On the program: z.B. www.fb2.fh-frankfurt.de

For national information sources cf. Sect. 8.8

7. CERTIFICATION

This Diploma Supplement refers to the following documents:
Urkunde über die Verleihung des Master-Grades vom TAG.MONAT.JAHR
Prüfungszeugnis vom TAG.MONAT.JAHR
Transcript of records vom TAG.MONAT.JAHR

8. NATIONAL HIGHER EDUCATION SYSTEM

The information on the national higher education system on the following pages provides a context for the qualification and the type of higher education that awarded it.

(Offical Stamp/ seal)

Certification Date:

_____
Chairperson Examination Committee

8. INFORMATION ON THE GERMAN HIGHER EDUCATION SYSTEM[1]

8.1 Types of Institutions and Institutional Status

Higher education (HE) studies in Germany are offered at three types of Higher Education Institutions (HEI).[2]

- *Universitäten* (Universities) including various specialized institutions, offer the whole range of academic disciplines. In the German tradition, universities focus in particular on basic research so that advanced stages of study have mainly theoretical orientation and research-oriented components.

- *Fachhochschulen* (Universities of Applied Sciences) concentrate their study programmes in engineering and other technical disciplines, business-related studies, social work, and design areas. The common mission of applied research and development implies a distinct application-oriented focus and professional character of studies, which include integrated and supervised work assignments in industry, enterprises or other relevant institutions.

- *Kunst- und Musikhochschulen* (Universities of Art/Music) offer studies for artistic careers in fine arts, performing arts and music; in such fields as directing, production, writing in theatre, film, and other media; and in a variety of design areas, architecture, media and communication.

Higher Education Institutions are either state or state-recognized institutions. In their operations, including the organization of studies and the designation and award of degrees, they are both subject to higher education legislation.

8.2 Types of Programmes and Degrees Awarded

Studies in all three types of institutions have traditionally been offered in integrated "long" (one-tier) programmes leading to *Diplom*- or *Magister Artium* degrees or completed by a *Staatsprüfung* (State Examination).

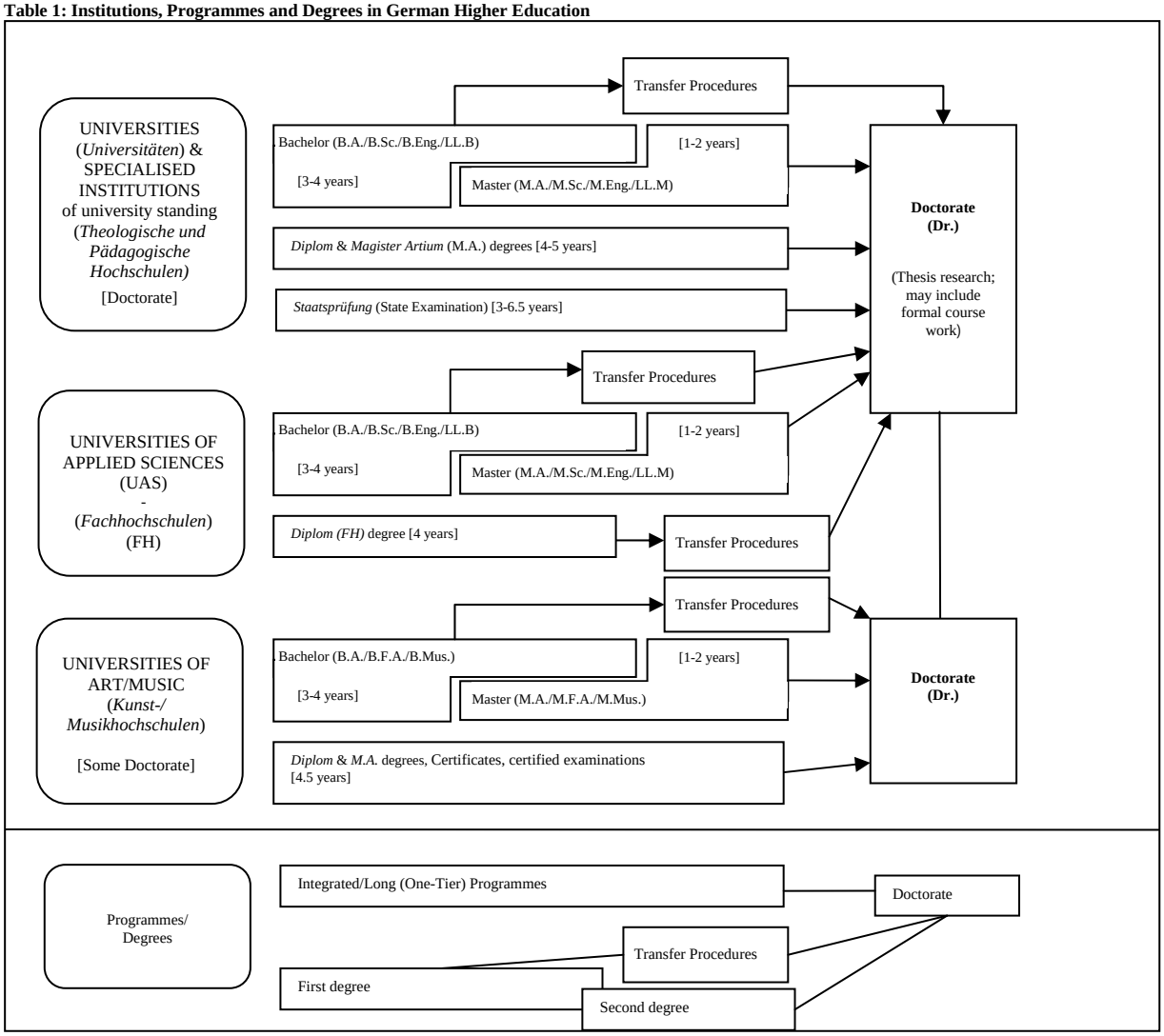
Within the framework of the Bologna-Process one-tier study programmes are successively being replaced by a two-tier study system. Since 1998, a scheme of first- and second-level degree programmes (Bachelor and Master) was introduced to be offered parallel to or instead of integrated "long" programmes. These programmes are designed to provide enlarged variety and flexibility to students in planning and pursuing educational objectives, they also enhance international compatibility of studies.

For details cf. Sec. 8.4.1, 8.4.2, and 8.4.3 respectively. Table 1 provides a synoptic summary.

8.3 Approval/Accreditation of Programmes and Degrees

To ensure quality and comparability of qualifications, the organization of studies and general degree requirements have to conform to principles and regulations established by the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany (KMK).[3] In 1999, a system of accreditation for programmes of study has become operational under the control of an Accreditation Council at national level. All new programmes have to be accredited under this scheme; after a successful accreditation they receive the quality-label of the Accreditation Council.[4]

Table 1: Institutions, Programmes and Degrees in German Higher Education



8.4 Organization and Structure of Studies

The following programmes apply to all three types of institutions. Bachelor's and Master's study courses may be studied consecutively, at various higher education institutions, at different types of higher education institutions and with phases of professional work between the first and the second qualification. The organization of the study programmes makes use of modular components and of the European Credit Transfer and Accumulation System (ECTS) with 30 credits corresponding to one semester.

8.4.1 Bachelor

Bachelor degree study programmes lay the academic foundations, provide methodological skills and lead to qualifications related to the professional field. The Bachelor degree is awarded after 3 to 4 years.
The Bachelor degree programme includes a thesis requirement. Study courses leading to the Bachelor degree must be accredited according to the Law establishing a Foundation for the Accreditation of Study Programmes in Germany.[5]
First degree programmes (Bachelor) lead to Bachelor of Arts (B.A.), Bachelor of Science (B.Sc.), Bachelor of Engineering (B.Eng.), Bachelor of Laws (LL.B.), Bachelor of Fine Arts (B.F.A.) or Bachelor of Music (B.Mus.).

8.4.2 Master

Master is the second degree after another 1 to 2 years. Master study programmes must be differentiated by the profile types "more practice-oriented" and "more research-oriented". Higher Education Institutions define the profile of each Master study programme.
The Master degree study programme includes a thesis requirement. Study programmes leading to the Master degree must be accredited according to the Law establishing a Foundation for the Accreditation of Study Programmes in Germany.[6]
Second degree programmes (Master) lead to Master of Arts (M.A.), Master of Science (M.Sc.), Master of Engineering (M.Eng.), Master of Laws (L.L.M), Master of Fine Arts (M.F.A.) or Master of Music (M.Mus.). Master study programmes, which are designed for continuing education or which do not build on the preceding Bachelor study programmes in terms of their content, may carry other designations (e.g. MBA).

8.4.3 Integrated "Long" Programmes (One-Tier): *Diplom* degrees, *Magister Artium, Staatsprüfung*

An integrated study programme is either mono-disciplinary (*Diplom* degrees, most programmes completed by a *Staatsprüfung*) or comprises a combination of either two major or one major and two minor fields (*Magister Artium*). The first stage (1.5 to 2 years) focuses on broad orientations and foundations of the field(s) of study. An Intermediate Examination (*Diplom-Vorprüfung* for *Diplom* degrees; *Zwischenprüfung* or credit requirements for the *Magister Artium*) is prerequisite to enter the second stage of advanced studies and specializations. Degree requirements include submission of a thesis (up to 6 months duration) and comprehensive final written and oral examinations. Similar regulations apply to studies leading to a *Staatsprüfung*. The level of qualification is equivalent to the Master level.

- Integrated studies at *Universitäten (U)* last 4 to 5 years (*Diplom* degree, *Magister Artium*) or 3 to 6.5 years (*Staatsprüfung*). The *Diplom* degree is awarded in engineering disciplines, the natural sciences as well as economics and business. In the humanities, the corresponding degree is usually the *Magister Artium* (M.A.). In the social sciences, the practice varies as a matter of institutional traditions. Studies preparing for the legal, medical, pharmaceutical and teaching professions are completed by a *Staatsprüfung*.
The three qualifications (*Diplom*, *Magister Artium* and *Staatsprüfung*) are academically equivalent. They qualify to apply for admission to doctoral studies. Further prerequisites for admission may be defined by the Higher Education Institution, cf. Sec. 8.5.

- Integrated studies at *Fachhochschulen (FH)*/Universities of Applied Sciences (UAS) last 4 years and lead to a *Diplom (FH)* degree. While the *FH*/UAS are non-doctorate granting institutions, qualified graduates may apply for admission to doctoral studies at doctorate-granting institutions, cf. Sec. 8.5.

- Studies at *Kunst- and Musikhochschulen* (Universities of Art/Music etc.) are more diverse in their organization, depending on the field and individual objectives. In addition to *Diplom/Magister* degrees, the integrated study programme awards include Certificates and certified examinations for specialized areas and professional purposes.

8.5 Doctorate

Universities as well as specialized institutions of university standing and some Universities of Art/Music are doctorate-granting institutions. Formal prerequisite for admission to doctoral work is a qualified Master (UAS and U), a *Magister* degree, a *Diplom*, a *Staatsprüfung*, or a foreign equivalent. Particularly qualified holders of a Bachelor or a *Diplom (FH)* degree may also be admitted to doctoral studies without acquisition of a further degree by means of a procedure to determine their aptitude. The universities respectively the doctorate-granting institutions regulate entry to a doctorate as well as the structure of the procedure to determine aptitude. Admission further requires the acceptance of the Dissertation research project by a professor as a supervisor.

8.6 Grading Scheme

The grading scheme in Germany usually comprises five levels (with numerical equivalents; intermediate grades may be given): "*Sehr Gut*" (1) = Very Good; "*Gut*" (2) = Good; "*Befriedigend*" (3) = Satisfactory; "*Ausreichend*" (4) = Sufficient; "*Nicht ausreichend*" (5) = Non-Sufficient/Fail. The minimum passing grade is "*Ausreichend*" (4). Verbal designations of grades may vary in some cases and for doctoral degrees.
In addition institutions may already use the ECTS grading scheme, which

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1 The information covers only aspects directly relevant to purposes of the Diploma Supplement. All information as of 1 July 2005.

2 Berufsakademien are not considered as Higher Education Institutions, they only exist in some of the Länder. They offer educational programmes in close cooperation with private companies. Students receive a formal degree and carry out an apprenticeship at the company. Some Berufsakademien offer Bachelor courses which are recognized as an academic degree if they are accredited by a German accreditation agency.

3 Common structural guidelines of the Länder as set out in Article 9 Clause 2 of the Framework Act for Higher Education (HRG) for the accreditation of Bachelor's and Master's study courses (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 10.10. 2003, as amended on 21.4.2005).

4 "Law establishing a Foundation 'Foundation for the Accreditation of Study Programmes in Germany'", entered into force as from 26.2.2005, GV. NRW. 2005, nr. 5, p. 45 in connection with the Declaration of the Länder to the Foundation "Foundation: Foundation for the Accreditation of Study Programmes in Germany" (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 16.12.2004.

5 See note No. 4.

6 See note No. 4.