# Program of study IB

## Computer Science 1 (IB 110)

| | |
|---|---|
| Course title: | Computer Science 1 |
| Courses: | Computer Science 1, Prof. Dr. Christian Pape<br>Computer Science 1 Exercise, Prof. Dr. Christian Pape |
| Semester: | 1 |
| Responsible lecturer: | Prof. Dr. Christian Pape |
| ECTS: | 8 |
| Contact hours: | 6 |
| Course contents: | The courses of this module teach the students fundamental programming and algorithmic skills. The students should be enabled to analyze small problems, find solutions to these problems, and develope them in the Java programming language. |

## Computer Science 1 (IB 111)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Christian Pape |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 150 hours (60 hours presence, 90 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 5 |
| Objective of the course: | The course teaches the following skills:<br>• Designing basic HTML pages, including Cascading Style Sheets (CSS).<br>• Fundamentals of the Java programming language: variables, control structures, methods, classes, objects, fields, interfaces, documentation with Javadoc, testing with JUnit, programming conventions.<br>• Using recursion as a problem solving and programming concept.<br>• Applying Object Oriented Analysis and Design using UML (basics of activity, class, object and package diagrams).<br>• The design and cost estimate of algorithms using typical search and sort procedures and backtracking.<br>• Applying design paradigms as stepwise refinement, bottom-up, top-down and divide-and-conquer. |

| | |
|---|---|
| Contents: | After attending the lecture, the students are able to solve small computer science problems with the Java programming language. They know common design methods, basic search and sort procedures, and can apply them in practice. |
| Kind of work: | Lecture participation. Solving simple exercises in the lecture with teacher support. |
| Recommended reading: | Selected exercises with solutions, slides in PDF format, Java programs and their documentation as Javadoc. Supplementary Java exercises with solutions to deepen the programming skills. |

## Computer Science 1 Exercise (IB 112)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Christian Pape |
| Type of course, Contact hours: | Exercise, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | Within weekly practical assigments the students apply the theoretical knowledge of the Informatik 1 lecture into practice.<br>• They setup a homepage,<br>• use an integrated development environment,<br>• programming simple calculations with Java (variables, expressions, control structures),<br>• write object-oriented Java programs,<br>• implement recursive algorithms, including backtracking, search and sort procedures.<br>In order to simulate the maintainance of software over a long period of time, the students have to build a more complex programm with additional features every week. |
| Contents: | The students turn small computer sciences problems into practice (design, implementation with Java, testing, debugging). The students are able to create their own homepage. |
| Kind of work: | Practical assignment in a computer laboratory. |
| Recommended reading: | |

# Computer Engineering 1 (IB 120)

| | |
|---|---|
| Course title: | Computer Engineering 1 |

| | |
|---|---|
| Courses: | Electrical Engineering and Physical Foundations, Prof. Dr. Bertold Deppisch<br>Computer Engineering 1, Prof. Dr. Dirk Hoffmann |
| Semester: | 1 |
| Responsible lecturer: | Prof. Dr. Dirk Hoffmann |
| ECTS: | 7 |
| Contact hours: | 6 |
| Course contents: | The courses of this module teach the students fundamental concepts from the field of computer engineering. Both mathematical and theoretical concepts are covered. |

# Computer Engineering 1 (IB 121.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Dirk Hoffmann |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 4 |
| Objective of the course: | After having successfully completed the course, the students should<br>• know the standard terminologies and methodologies in this area<br>• be able to mathematically describe hardware circuits<br>• be able to design, analyze and minimize small circuits |
| Contents: | The lecture gives a basic understanding for building a computer. It is shown how the functionality of a computer can be decomposed into elementary operations. It is shown how to elementary functional components are designed, how the interact and how they can be used to design more complex circuits. The following topics are covered in detail: Basic operation of a computer; knowledge of the basic logical circuit blocks; technologies for the realization of the basic components; knowledge of the main electrical characteristics; different codes for numbers and characters; boolean algebra; methods of simplification boolean expressions; the use of CAE software; designing combinatorial circuits; design of synchronous switching networks; Flipflops; counters and registers. |
| Kind of work: | Lecture |
| Recommended reading: | Slides, blackboard, exercise sheets |

## Electrical Engineering and Physical Foundations (IB 121.b)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Bertold Deppisch |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 3 |
| Objective of the course: | After having successfully completed the course, the students should<br>• have background knowledge about physics and electrical engineering<br>• knows the basic terminology in this area |
| Contents: | The lecture starts with the introduction of electrical and magnetic fields and shows its various applications in the field of computer science. Topics include: Coulomb law, electrical fields, electrical currency, energy, Gauß law, condensators. Applications inlcude: creation of free electrons, accelleration of electrons in TVs, electrical circuits, transistor design, resistances of different materials, computation of R-C networks, magnetism, forces in magnetic fields, electrical induction, electrical engines, loudspeakers, hall effect. |
| Kind of work: | Lecture |
| Recommended reading: | |

# Theoretical Computer Science 1 (IB 130)

| | |
|---|---|
| Course title: | Theoretical Computer Science 1 |
| Courses: | Theoretical Computer Science 1, Prof. Dr. Heiko Körner |
| Semester: | 1 |
| Responsible lecturer: | Prof. Dr. Heiko Körner |
| ECTS: | 4 |
| Contact hours: | 4 |
| Course contents: | This course is an introduction to the basic areas of theoretical computer science. Participants of the lecture will be in a position to recognize the |

fundamental limitations of today's computers. Moreover, important techniques for proving mathematical theorems will be given, i.e., the correct application of logical arguments will be intensively trained.

## Theoretical Computer Science 1 (IB 131)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Heiko Körner |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 4 |
| Objective of the course: | This course gives an introduction to the following areas of theoretical computer science: mathematical logic, formal languages, proof techniques, the O-calculus, finite automata, regular languages and expressions, the Chomsky hierarchy, the pumping lemma for regular languages and the minimization of finite automata by the theorem of Myhill-Nerode. |
| Contents: | The course introduces the theory of formal languages. The goal is to convey the Chomsky hierarchy as a classification of the complexity of formal languages. Also, finite automata will be presented as representatives of today's computers, and their limitations will be identified. Another goal is to train the use of mathematical proofs using various techniques. |
| Kind of work: | This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials. |
| Recommended reading: | The substance of the lecture will be discussed at the blackboard. Lecture notes containing the complete material are also available. Furthermore, there are sample solutions to all exercises.<br><br>Literature: M. Sipser: Introduction to the Theory of Computation. Thomson Course Technology, 2005, ISBN 0-619-21764-2. |

# Mathematics for Computer Science 1 (IB 140)

| | |
|---|---|
| Course title: | Mathematics for Computer Science 1 |
| Courses: | Mathematics 1, Prof. Dr. Frank Schaefer<br>Mathematics 1 Laboratory, Prof. Dr. Frank Schaefer |
| Semester: | 1 |

| | |
|---|---|
| Responsible lecturer: | Prof. Dr. Frank Schaefer |
| ECTS: | 8 |
| Contact hours: | 6 |
| Course contents: | The students learn the mathematical foundations which are needed for applications within computer science. These applications include the areas of robotics, image processing, cryptography, digital technology, etc. Furthermore, the participants of this course learn to solve simple mathematical problems. |

# Mathematics 1 (IB 141)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Frank Schaefer |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 150 hours (60 hours presence, 90 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 5 |
| Objective of the course: | The participants should learn basic knowledge of mathematics and especially of linear algebra and acquire the methods to solve smaller mathematical tasks by themselves. |
| Contents: | Proof methods, relations, euqivalence relations, modulo-calculation, Euklid's algorithm, functions, operations, groups, rings, fields, polynomial rings, finite fields, interpolation, vector spaces, basis, dimension, linear equations, rank, Gauß-Jordan-algorithm, determinant, matrices, linear map, inverse matrices, rotation, scalarproduct, norm, vectorproduct, orthogonal matrizen, eigenvalues. |
| Kind of work: | Lecture,<br>Exercises,<br>Summary of the solutions in the lecture,<br>Tutorials for further assistance |
| Recommended reading: | Own writings from the blackboard,<br>Exercises and summaries from the internet,<br>Textbook: Peter Stingl: Mathematik für Fachhochschulen, Hanser Verlag, 7. Auflage, 2004, ISBN 3-446-22702-4 |

# Mathematics 1 Laboratory (IB 142)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Frank Schaefer |
| Type of course, Contact hours: | Laboratory course, 2 SWS |

| | |
|---|---|
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 3 |
| Objective of the course: | Improving the knowledge of the related lectures,<br>basics in computer-algebra systems, mathematical problem solving with computer assistance. |
| Contents: | With the help of the computer algebra system Maple different, applied mathematical questions from the fields of geometry, curves and linear equations will be solved . |
| Kind of work: | Exercises in the labs with Maple (instructor will be present). |
| Recommended reading: | Short introduction will be given. Exercises distributed in the classes and also<br>available on the internet. |

# Language Competence (IB 150)

| | |
|---|---|
| Course title: | Language Competence |
| Courses: | Foreign Languages, Mehrere Dozenten |
| Semester: | 1 |
| Responsible lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| ECTS: | 4 |
| Contact hours: | 4 |
| Course contents: | The learning of a foreign language is an integral component of the in the course of studies communicated key qualification. |

## Foreign Languages (IB 151)

| | |
|---|---|
| Name of lecturer: | Mehrere Dozenten |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 4 |
| Objective of the course: | The English learning program is to enable students to communicate properly in an English speaking working environment. |

| | |
|---|---|
| Contents: | After a grading test students can deepen their English skills to three grades. The entry level requires the competence grade A2 (basic user) in the six-stage common European reference framework. The first two grades (English for advanced learners 1 and 2) engage besides a recapitulation of grammar mainly in issues of job-oriented common language and cultural studies, e.g. job application letters, descriptions of products and services, business telephone calls, progress of formal and informal conferences, presentations etc. The thus achieved grade complies with 173 points in the TOEFL (computer-based) or the competence grade B2 (independent user) of the European reference framework. In the following grade special language skills (English for science and technics) are leant:<br>In business English the priority is on spoken language and small study groups. At the beginning of the semester each group founds its own company which advances dynamically during the course of the semester. At the same time vocabulary and phrasing in respect of topics like company structures, meetings, negotiation, marketing, production and sale, finances, comprehending of reports and presentations are gone through in order to make the attendees handle the language instruments to cope with each step of the simulation in English. The highlights of the course are a simulated exhibition, a hiring procedure and the group presentation.<br>In technical English the priority is on the learning and practice of a technical basis vocabulary and typical expressions of technical communication. |
| Kind of work: | Lecture participation, short talks, discussions |
| Recommended reading: | Literature depends on grade, PowerPoint presentations, execises, Videos, DVDs |

# Computer Science 2 (IB 210)

| | |
|---|---|
| Course title: | Computer Science 2 |
| Courses: | Computer Science 2, Prof. Dr.-Ing. Holger Vogelsang<br>Computer Science 2 Exercise, Prof. Dr.-Ing. Holger Vogelsang<br>Computer Science 2 Exercise, Dipl.-Inform. Anja Weidner |
| Semester: | 2 |
| Responsible lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| ECTS: | 7 |
| Contact hours: | 6 |
| Course contents: | The module is based on module "Informatik 1”. The students will learn to develop a computer science project using object oriented techniques in C++. They become acquainted with advanced analysis, design and realization competences as well as abstract data types and their |

implementation by data structures and algorithms. The students will learn to choose an appropriate data type depending on the application area and the given runtime conditions.

## Computer Science 2 (IB 211)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 4 |
| Objective of the course: | The module is based on module "Informatik 1”. The students will learn to develop a computer science project using object-oriented techniques in C++. They become acquainted with advanced analysis, design and realization competences as well as abstract data types and their implementation by data structures and algorithms. The students will learn to choose an appropriate data type depending on the application area and the given runtime conditions. |
| Contents: | The lecture introduces programming in C++ with a first focus on pointers and dynamic memory management. The next topics are object-oriented techniques like inheritance, method overwriting and operator overloading. Based on this UML is applied to model classes and their relationships. The last main part of the lecture discusses different data structures like linked lists, vectors, trees and hashtables. Iterators are used as a binding element between algorithms and data structures. The students will be able to apply the standard template library (STL). |
| Kind of work: | Preparation of lecture contents and exam |
| Recommended reading: | On the lecture homepage: PowerPoint presentation, program examples, script<br>Books: |

- Ulrich Breymann, C++ - Einführung und professionelle Programmierung, Hanser, 2005
- Bjarne Stroustrup, Die C++ Programmiersprache, Addison-Wesley, 2000
- H. Reß, G. Viebeck, Datenstrukturen und Algorithmen. Objekt-orientiertes Programmieren mit C++, Fachbuchverlag Leipzig, 2002
- RRZN-Handbuch zu C++

## Computer Science 2 Exercise (IB 212)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Holger Vogelsang |

| | |
|---|---|
| | Dipl.-Inform. Anja Weidner |
| Type of course, Contact hours: | Exercise, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | The exercise allows the student to apply the theoretical knowledge of "Informatik 2". They learn to use a standard integrated development environment. |
| Contents: | The students solve C++ exercises and model small applications using UML class diagrams. |
| Kind of work: | Practical exercise with discussion of solutions |
| Recommended reading: | Script, compulsory and optional exercises on the homepage, solutions for optional exercises |

# Software Laboratory (IB 220)

| | |
|---|---|
| Course title: | Software Laboratory |
| Courses: | Software Laboratory, Prof. Dr. Heiko Körner<br>Software Laboratory, Prof. Dr. Christian Pape<br>Software Laboratory, Dipl.-Inform. Mathias Supp<br>Software Laboratory, Prof. Dr.-Ing. Holger Vogelsang<br>Software Laboratory, Dipl.-Inform. Anja Weidner |
| Semester: | 2 |
| Responsible lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| ECTS: | 5 |
| Contact hours: | 4 |
| Course contents: | The students learn to apply the theoretical knowledge of “Informatik 2” using the programming language Java. They have design and implement projects with an increasing level of difficulty. The main topics are:<br>• Practicing object oriented programming techniques<br>• Preferring abstractions over concrete implementations<br>• Modeling class and package diagrams before starting an implementation<br>• Code quality assurance by writing automated tests<br>• Teamwork |

# Software Laboratory (IB 221)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Holger Vogelsang<br>Dipl.-Inform. Anja Weidner<br>Dipl.-Inform. Mathias Supp<br>Prof. Dr. Heiko Körner<br>Prof. Dr. Christian Pape |
| Type of course, Contact hours: | Laboratory course, 4 SWS |
| Workload: | 150 hours (60 hours presence, 90 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 5 |
| Objective of the course: | The students learn to apply the theoretical knowledge of “Informatik 2” using the programming language Java. They have design and implement projects with an increasing level of difficulty. The main topics are:<br>• Practicing object oriented programming techniques<br>• Preferring abstractions over concrete implementations<br>• Modeling class and package diagrams before starting an implementation<br>• Code quality assurance by writing automated tests<br>• Teamwork |
| Contents: | The students implement projects with an increasing complexity in Java. They have to use generic classes, inheritance, polymorphism, abstract classes and interfaces and concepts for error handling and detection like exceptions, assertions and unit tests. Additionally they will learn to use elements of the Java class library and to model the classes and their relationships with UML. |
| Kind of work: | Laboratory work in small groups |
| Recommended reading: | On the homepage: Project description with a step-by-step instruction, Java script, optional exercise with solutions, books:<br>• C. Ullenboom, Java ist auch eine Insel, Galileo Computing, 2007<br>• F. Jobst, Programmieren in Java, Hanser Fachbuchverlag, 2005<br>• RRZN-Handbuch "Java" |

# Languages and Metalanguages (IB 230)

| | |
|---|---|
| Course title: | Languages and Metalanguages |
| Courses: | Languages and Metalanguages, Prof. Dr. Heiko Körner<br>Web Programming, Prof. Dr. Christian Pape |
| Semester: | 2 |

| | |
|---|---|
| Responsible lecturer: | Prof. Dr. Christian Pape |
| ECTS: | 5 |
| Contact hours: | 4 |
| Course contents: | The students learn the theoretical foundations of formal languages, computability and complexity theory.. They apply these fundamentals using the industry standard Extensible Markup Language (XML) to practical examples. |

# Web Programming (IB 231.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Christian Pape |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | The course teaches the basics of the following topics:<br>• Creating well-formed XML documents<br>• Document Type Declarations (DTD)<br>• XML Schemas Stylesheet Transformations (XSLT)<br>• Java data binding for XML<br>• Java Simple API for XML (SAX)<br>• Servlets and Java Server Pages<br><br>Parts of the course are teached as a practical assignment where the students apply their knowledge in a typical scenario: integration of a webshop with a enterprise resource planning system (the systems are only simulated). |
| Contents: | The course language is English to teach english technical terms.<br>The students learn to use the eXtensible Markup Language (XML) as an application of formal language theory and as a standard for electronic document interchange over the Internet. They learn to create small dynamic web applications with Java Servlets and Java Server Pages. |
| Kind of work: | Lecture, practical assignment |
| Recommended reading: | Lecture notes, slides (PDF), multiple examples of Java programs and XML. |

# Languages and Metalanguages (IB 231.b)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Heiko Körner |

| | |
|---|---|
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The course deals with the following areas of theoretical computer science: context-free languages, pushdown automata, the pumping lemma for context-free languages, the closure of context-free languages under several operations, Turing machines, the Church-Turing thesis, undecidability, Gödel's incompleteness theorem and the theory of NP-completeness.<br>For this course some basics concerning theoretical computer science are required (regular languages, finite automata, O-calculus, etc.). This knowledge can be purchased in the lecture Theoretical Computer Science I. |
| Contents: | The course presents some important features concerning context-free languages and the limitations of calculation and decidability. An introduction to the theory of computationally hard problems is also given. |
| Kind of work: | This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials. |
| Recommended reading: | The substance of the lecture will be discussed at the blackboard. Lecture notes containing the complete material are also available. Furthermore, there are sample solutions to all exercises.<br><br>Literature: M. Sipser: Introduction to the Theory of Computation. Thomson Course Technology, 2005, ISBN 0-619-21764-2. |

# Mathematics 2 (IB 240)

| | |
|---|---|
| Course title: | Mathematics 2 |
| Courses: | Mathematics 2, Prof. Dr. Britta Nestler<br>Mathematics 2 Laboratory, Prof. Dr. Britta Nestler |
| Semester: | 2 |
| Responsible lecturer: | Prof. Dr. Britta Nestler |
| ECTS: | 7 |
| Contact hours: | 6 |
| Course contents: | The module ,,Mathematics for computer science 2'' directly builds on the acquired knowledges of the module ,,Mathematics for computer science |

1''. The aims of the course are to communicate advanced topics of differential and integral calculus and to discuss applications. The main topics are ,,functions, sequences and series, differential and integral calculus for multiple variables, ordinary differential equations''. The students shall be provided with the facility of self-consistently solving straight forward mathematical problems.

# Mathematics 2 (IB 241)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Britta Nestler |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 4 |
| Objective of the course: | |
| Contents: | 1. Functions<br>1.1 Definition and construction<br>1.2 Special properties of functions<br>1.3 Special functions I<br>1.4 Limit and continuity<br>1.5 Special functions II<br>1.6 Power series<br><br>2. Differential calculus<br>2.1 Derivation of a function<br>2.2 Derivation laws<br>2.3 Applications of differential calculus<br><br>3. Integral calculus<br>3.1 Antiderivative<br>3.2 Methods for integration<br>3.3 Definite Integral<br>3.4 Applications of integral calculus<br>4. Functions of multiple variables<br>4.1 Fundamentals<br>4.2 Differential calculus for multiple variables<br>4.3 Integral calculus for multiple variables<br>5. Ordinary differential equations |
| Kind of work: | Advancement of logical and analytical knowlegde and methods, introduction to analysis and calculus as well as to numerical algorithms, practical experience in solving analytic problems. |
| Recommended | Weekly distributed exercise sheets, discussion of the solution of the excercises, preparation of end of semester exams, continuous communication of the lecture contents. |
| | Blackboard for the lecture, manuscript, weekly exercise sheets and sample solutions, previous exams, course material is regularly been |

| | |
|---|---|
| reading: | uploaded on a website. |

## Mathematics 2 Laboratory (IB 242)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Britta Nestler |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 3 |
| Objective of the course: | |
| Contents: | |
| Kind of work: | |
| Recommended reading: | |

# Computer Engineering 2 (IB 250)

| | |
|---|---|
| Course title: | Computer Engineering 2 |
| Courses: | Computer Engineering 2, Prof. Dr.-Ing. Albrecht Ditzinger<br>Digital Technology Laboratory, Prof. Dr.-Ing. Albrecht Ditzinger<br>Digital Technology Laboratory, Prof. Dr. Norbert Link |
| Semester: | 2 |
| Responsible lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger |
| ECTS: | 7 |
| Contact hours: | 6 |
| Course contents: | The module is based upon the instruction in the module TI1. In this module the foundations for design of embedded systems are laid. This includes computer aided hardware design techniques and an introduction into the hardware design lanquage VHDL. Additionally, students will be familiarized with internal functions of various processors and peripherals. All knowledge gained will be reinforced by practical work in the laboratory. |

## Computer Engineering 2 (IB 251)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger |
| Type of course, Contact hours: | Lecture, 4 SWS |

| | |
|---|---|
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 4 |
| Objective of the course: | In the field of digital technology the student will become familiar with the use of CAE tools over multiple design levels. The student will also attain a basic understanding of the various structures of programmable logic. This will be further expanded using exercises to provide the student an introduction to larger designs using heirarchal design techniques and basic knowledge in VHDL.<br>In the area of processors, the student will attain a basic understanding of the internal structure of a computer and machine level programming. Relationships between processors and peripheral devices will be fully explained. |
| Contents: | The lecture will provide an overview of programmable logic. This will be followed by a description of the basic modular devices that comprise programmable logic. The students will particapate in an exercise which exposes them to the CAD for programmable logic.<br><br>An introduction to the design language VHDL will be given. This will be expanded to provide background in parallel and sequential description modes used in VHDL. The remaining description modes (processes and structures) will also be discussed.<br><br>On the processor side, the lecture will cover the following, basic processor hardware, processor architecture, addressing modes, instructions, memory mapping, peripherals and bit processing. |
| Kind of work: | The student will be required to come prepared to participate in the lecture and will be expected to be able to develop a summary upon completion of the lecture, all exercises provided for reinforcement will be required to be individual work. |
| Recommended reading: | Powerpoint slide, personal notes, web based exercises and the suggested solution (provided upon request). |

# Digital Technology Laboratory (IB 252)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger<br>Prof. Dr. Norbert Link |
| Type of course, Contact hours: | Laboratory course, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 3 |
| Objective of the | The student will conduct exercises which demonstrate knowledge |

| | |
|---|---|
| course: | gained during the lecture on actual hardware. The student will use the exercises to reinforce knowledge gained and understanding thereof. The student will work with a CAE system. They will design, test, and implement in hardware basic VHDL design. Microcontroller design system will be used by the students to develop microcontroller applications. Design and operation of peripherals will be explored. |
| Contents: | Lab experiments will be conducted using:<br>• Programmable logic devices<br>• VHDL<br>• Microcontrollers<br>• Peripherals<br>• Timers and Counters |
| Kind of work: | All laboratory work will be group work. It will include the conduct of the experiment, demonstration of the required result and be prepared to answer questions on the work and the results. Groups are on their own and are required to come to the laboratory prepared to conduct the exercise. Each group will prepare a final documentation of the exercise. |
| Recommended reading: | Exercises, equipment provided and various manuals and other support material. |

# System Software (IB 310)

| | |
|---|---|
| Course title: | System Software |
| Courses: | System Software, Prof. Dr. Lothar Gmeiner |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Lothar Gmeiner |
| ECTS: | 4 |
| Contact hours: | 4 |
| Course contents: | Participants should know the design and implementation principles of modern operating systems. They should learn how to think in parallel structures and solve problems with the parallel programming paradigm. |

# System Software (IB 311)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Lothar Gmeiner |
| Type of course, Contact hours: | Lecture, 4 SWS |

| | |
|---|---|
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 4 |
| Objective of the course: | Participants should know the design and implementation principles of modern operating systems. They should learn to think in parallel structures and solve problems with the parallel programming paradigm. |
| Contents: | Computer hardware and the interface to the operating systems; batch-, dialogue- and real-time processing; operating systems architecture following the layer-, the client-/server- and the objectoriented-model; processes, threads, interprocess synchronisation and communication via semaphores, messagequeues and monitors; classical IPC Problems (reader/writer, producer/consumer etc.); scheduling strategies; deadlock prevention and detection; the input/output-subsystem including driver-programming; file management (FAT, NTFS, Unix file system); memory management: swapping, paging, virtual memory; Distributed operating systems; RPC ; NFS; nearlly each topic is illustrated with implementation details from the UNIX- and WINDOWS operating systems. |
| Kind of work: | Lecture supported by transparencies and Power Point Slides. Student questions are welcome. In parallel to the lecture the participants should control their knowledge using the old exams and their solutions (available on the server). |
| Recommended reading: | • Powerpoint slides<br>• Word handouts<br>• Tanenbaum: Modern operating systems, Pearson Studies, 2002 (german edition)<br>• Collection of old exams and their solutions |

# System Programming (IB 320)

| | |
|---|---|
| Course title: | System Programming |
| Courses: | System Programming, Prof. Dr. Thomas Fuchß |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Thomas Fuchß |
| ECTS: | 5 |
| Contact hours: | 4 |
| Course contents: | The module focuses on techniques for system programming in C++. Including compiler construction, interprocess communication, and dynamic |

data structures.

## System Programming (IB 321)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Thomas Fuchß |
| Type of course, Contact hours: | Laboratory course, 4 SWS |
| Workload: | 150 hours (60 hours presence, 90 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 5 |
| Objective of the course: | The course enhances the ability to work in teams, and programming skills. Basic and advanced concepts of system programming, compiler construction, and interprocess communications are learned. |
| Contents: | The course is organized in three exercises, covering compiler construction and interprocess communication. Starting with a scanner, the students consolidate their skills in handling large dynamic data structures, pointers, and doing low level IO. The second exercise focuses on the development of a recursive descendent parser and a short introduction to semantic analysis and code generation. The third exercise is an introduction to the field of interprocess communication. Within the exercise, elementary techniques and concepts are trained:<br>• generating processes<br>• terminating processes<br>• synchronizing processes<br>• using message queues and shared memories |
| Kind of work: | Attended teamwork and three lectures. |
| Recommended reading: | Slides and textbooks:<br>• A.V. Aho, R. Sethi und J.D. Ullmann. Compilerbau - 2nd Edition - Oldenburg, 1999.<br>• D. Grune et. al. Modern compiler design - Wiley, 2000.<br>• Andrew S. Tanenbaum. Betriebssysteme, Entwurf und Realisierung Teil 1 - Hanser, 1990.<br>• Helmut Herold. UNIX-Systemprogrammierung - Addison-Wesley, 1996. |

# Databases and Communication Networks 1 (IB 330)

| | |
|---|---|
| Course title: | Databases and Communication Networks 1 |
| Courses: | Databases 1 Laboratory, Prof. Dr. Ulrich Bröckl |

| | |
|---|---|
| | Databases 1, Prof. Dr. Ulrich Bröckl<br>Communication Networks 1, Prof. Dr. Lothar Gmeiner<br>Databases 1 Laboratory, Prof. Klaus Gremminger |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Ulrich Bröckl |
| ECTS: | 7 |
| Contact hours: | 6 |
| Course contents: | This module enables the understanding of database systems and communications networks. The students know the popular models of communication and database technology and are furthermore able to apply these models onto unknown, e.g. new, systems in order to categorize and evaluate them. Pros and cons of different architectures are known and are considered when selecting an architecture for their own projects. In the database area students are proficient in the SQL-92 standard and are capable to select, install, and run database systems securely. |

# Databases 1 (IB 331.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Ulrich Bröckl |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | This module provides the knowledge on database systems and the goal oriented implementation of complex information systems. The students are familiar with common database architectures and data organizations as well as conceptual and logical data models. They know the transaction concept and use it actively to ensure the ACID principle of their applications. The students are proficient in using the database language interface SQL-92; they can be design and carry out database application programming under Java with JDBC and ESQL independently. Typical problems, such as the ambiguity of NULL values, are known and avoided in their projects. |
| Contents: | Introduction of information systems, fundamentals of database systems, database organization, data models, database schema, architecture: 3-tier model, internal and external components, client-server architecture, implementation of database systems, indexes, language interfaces: SQL92 (queries, DDL, DML), SQLJ , JDBC, recovery and transactions. |

Kind of work: Seminar lessons; exercises - some success with direct success control on the beamer.

Recommended reading: Script, sample databases of lectures, exercises and collection of old exams and their solutions;
Textbooks:

- "Grundlagen von Datenbanksystemen", Ausgabe Grundstudium (Taschenbuch) von Ramez Elmasri, Shamkant B. Navathe, Pearson, 2005, ISBN: 3827371538
- "Datenbanksysteme" von Alfons Kemper, Andre Eickler, Oldenbourg, 2006, ISBN: 3486576909
- "Datenbanken & Java. JDBC, SQLJ, ODMG und JDO" von Gunter Saake, Kai-Uwe Sattler, Dpunkt Verlag, 2003, ISBN: 3898642283

# Communication Networks 1 (IB 331.b)

Name of lecturer: Prof. Dr. Lothar Gmeiner

Type of course, Contact hours: Lecture, 2 SWS

Workload: 60 hours (30 hours presence, 30 hours self-contained work)

GI category: Informatik

ECTS: 2

Objective of the course: Participants should know the basics and principles of computer networks, the network architecture and the protocols.

Contents: Distributed systems; data transmission and communication networking techniques (circuit/packet switching); Serial / Parallel, fault detection-/protection mechanisms; service and protocol specification; flow control; negotiating qualities of service; multiplexing; time charts and finite state machines as a means of describing protocols; OSI reference model (Layers, protocols, services), protocol-stacks; the physical layer: analog and digital transmission, transmission media, STP/UDP, ISDN, xDSL; the data link layer: character and bitorientierte protocols (BSC, HDLC), Local area networks (LAN e.g.ETHERNET, Token Ring), topology, access procedures; the network layer: connection oriented and connectionless services, routing, congestion control; the transport layer: transport layer classes; RPC; socketprogramming; TCP / IP; the application system: Internet, services and protocols in the Internet environment (Telnet, FTP , SMTP, SNMP, DNS, Web, HTML / HTTP);

Kind of work: Lecture supported by transparencies and Power Point Slides. Student questions are welcome. In parallel to the lecture the participants should control their knowledge using the old exams and their solutions (available

on the server).

Recommended reading:
• Powerpoint slides
• Word handouts
• Tanenbaum: Computer Networks, Pearson Studies, 2003 (german edition)
• Collection of old exams and their solutions

## Databases 1 Laboratory (IB 332)

Name of lecturer: Prof. Dr. Ulrich Bröckl
Prof. Klaus Gremminger

Type of course, Contact hours: Laboratory course, 2 SWS

Workload: 90 hours (30 hours presence, 60 hours self-contained work)

GI category: Informatik

ECTS: 3

Objective of the course: The skills learned in the lecture `Database 1´ are deepened in group work and practiced. The interaction of a database with a graphical user interface is understood. The advantages - but sometimes the trouble too - of test driven development will be experienced in practice and perceived as being positive.

Contents: A database application for a flight reservation system is designed and prototypically implemented. This includes setting up a DB scheme, the design and testing of SQL queries, the use of transactions and transaction levels, as well as programming a seat reservation transaction with Java, JDBC and SQLJ-based on Oracle.

Kind of work: Supervised laboratory with final presentation on the computer, self-work, preparation and after working of lab sessions, prepare a report of the laboratory tasks.

Recommended reading: Sample database, JUnit test cases, test-GUI;
Textbooks:

- "Grundlagen von Datenbanksystemen", Ausgabe Grundstudium (Taschenbuch) von Ramez Elmasri, Shamkant B. Navathe, Pearson, 2005, ISBN: 3827371538
- "Datenbanksysteme" von Alfons Kemper, Andre Eickler, Oldenbourg, 2006, ISBN: 3486576909
- "Datenbanken & Java. JDBC, SQLJ, ODMG und JDO" von Gunter Saake, Kai-Uwe Sattler, Dpunkt Verlag, 2003, ISBN: 3898642283

# Man-Machine-Communication (IB 340)

| | |
|---|---|
| Course title: | Man-Machine-Communication |
| Courses: | Man-Machine-Communication, Prof. Dr. Ulrich Bröckl<br>Man-Machine-Communication Design, Prof. Dr. Ulrich Bröckl |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Ulrich Bröckl |
| ECTS: | 4 |
| Contact hours: | 3 |
| Course contents: | The main objective of the module is the ability of students to create effective, efficient and satisfactory end user interfaces. |

# Man-Machine-Communication (IB 341)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Ulrich Bröckl |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 2 |
| Objective of the course: | The students know the rules of ergonomics and software; they can evaluate and improve the usability of a user interface actively. The style guide of a popular user interface is known and respected. The process of user centered design is learned. The special pitfalls when testing the usability of user interfaces are well known and avoided by a careful test preparation and implementation. |
| Contents: | Software ergonomics, rules of user centered design (style guides, typography), methodological design of user interfaces: analysis, design, implementation, testing the usability. |
| Kind of work: | Seminar teaching; exercises. |
| Recommended reading: | Script, style guides, exercises and collection of old exams and their solutions;<br>Textbooks:<br>• "Grundlagen der Mensch-Computer-Interaktion" von Markus Dahm, Pearson Studium, 2005, ISBN: 3827371759<br>• "GUI- Design" von Ivo Wessel, Hanser Fachbuch, 2002, ISBN: 3446219617 |

# Man-Machine-Communication Design (IB 342)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Ulrich Bröckl |
| Type of course, Contact hours: | Exercise, 1 SWS |
| Workload: | 60 hours (15 hours presence, 45 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | The contentsand skills of the MMC (Man-Machine-Communication) lecture are deepened and practiced in group work. In particular, the social process of user centered design and its problems are understood. Conflict resolution skills to resolve conflicting opinions and diverging targets will be rehearsed.<br>The high quality requirements by the end user are recognized and successfully implemented in the practical work. |
| Contents: | An MMC-task which is standard practice is designed starting from task analysis up to the paper prototype. This prototype is subject - possibly over several iterations - of a usability test until the specified quality targets are reached. |
| Kind of work: | Supervised group work with presentation and discussion; test the usability of the prototype, prepare a test report with proposals for improvements. |
| Recommended reading: | Script, eye-tracker and user monitoring space in the Usability Lab<br>Textbooks:<br>• "GUI Design Essentials " von Susan Weinschenk, Pamela Jamar, Sarah C. Yeo, Verlag John Wiley & Sons, 1997, ISBN: 0471175498 |

# Automation (IB 350)

| | |
|---|---|
| Course title: | Automation |
| Courses: | Automation Laboratory, Prof. Dr. Norbert Link<br>Automation, Prof. Dr. Karl-Heinz Meisel |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Karl-Heinz Meisel |
| ECTS: | 6 |
| Contact hours: | 5 |
| Course contents: | The students obtain fundamental and specific technological skills in the field of computer aided automation in computer science. The course features special hardware components, and particularly real time |

programming techniques as well as the corresponding programming languages. Hands-on lab exercises will foster the essential topics.

# Automation (IB 351)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Karl-Heinz Meisel |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | Basics and specifics of automation in computer science |
| Contents: | Examples of automation, special requirements for automation technology in computer science, closed loop controller (PID controller, Fuzzy controller), computers in automation, communication between computers in automation technology (industrial bus systems), process signals and interfaces, sensors and actors, Auto-ID-Systems (bar codes, RFID), software for automation systems, introduction to programmable logic controllers (PLC) |
| Kind of work: | Seminar |
| Recommended reading: | Lecture notes, Literature: |


- Rembold, U., Levi, P. : Realzeitsysteme zur Prozeßautomatisierung, Carl Hanser Verlag, München Wien, 1994
- MANN, H., SCHIFFELGEN, H., FRORIEP, R. : Einführung in die Regelungstechnik, Carl- Hanser Verlag, München, Wien, 2000
- Etschberger, K. (Hrsg) : CAN, Controller Area Network, Hanser-Verlag, München, 2001
- Tietze, U. , Schenk, Ch. : Halbleiter-Schaltungstechnik, Springer-Verlag, Berlin, 2005
- DATA LOGIC : Der Strichcode-Fibel, Firmenprospekt, 2008
- FINKENZELLER,K.: RFID-Handbuch, Hanser Verlag, München, Wien, 2006


# Automation Laboratory (IB 352)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Norbert Link |
| Type of course, Contact hours: | Laboratory course, 3 SWS |
| Workload: | 120 hours (45 hours presence, 75 hours self-contained work) |
| GI category: | Informatik |

| | |
|---|---|
| ECTS: | 4 |
| Objective of the course: | The laboratory training takes up and deepens the topics of the lecture “automation” and puts emphasis on software development for industrial control applications. With the example of handling system programming, the whole development process is executed, from modelling of dynamical, reactive systems until their implementation in software and system tests. This comprises system communication and synchronisation as well as process visualisation. The students take different roles of the process actors from the head of the project to the programmer and thereby get an overview over the whole development process. |
| Contents: | Practice of development processes for industrial, reactive systems with co-operating handling systems: modelling of system dynamics by means of state charts or Petri networks, implementation of the formal software models in PLC software (via AWL/FUP/KOP and STEP7-Graph), process visualisation on an control center PC (via WinCC), system communication via TCP/IP and real time channels, system co-operation. |
| Kind of work: | Seminar-style teaching, practice, reporting |
| Recommended reading: | Lecture notes, task descriptions, project guidelines and FAQs, all accessible via the internet. Handbooks and relevant literature is available on site and for homework in the library. |

# Business Administration (IB 360)

| | |
|---|---|
| Course title: | Business Administration |
| Courses: | Business Administration, Prof. Dr. Uwe Haneke |
| Semester: | 3 |
| Responsible lecturer: | Prof. Dr. Uwe Haneke |
| ECTS: | 4 |
| Contact hours: | 4 |
| Course contents: | The module aims at introducing students to the general concepts of business administration in order to make it easier for them to understand better business processes. The module prepares ground for the courses ERP-systems, business process management, business intelligence and project management. |

## Business Administration (IB 361)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Uwe Haneke |
| Type of course, Contact hours: | Lecture, 4 SWS |

| | |
|---|---|
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 4 |
| Objective of the course: | |
| Contents: | The areas<br>• economic environment<br>• legal forms<br>• organisation<br>• investment appraisal and financing<br>• marketing<br>• external accounting<br>• cost accounting<br>will be enhanced within the lecture. |
| Kind of work: | Lecture combined with exercise sessions. |
| Recommended reading: | PowerPoint slides, exercise-sheets, continuative information on the web |

# Internship Preparation and Roundup (IB 4P0)

| | |
|---|---|
| Course title: | Internship Preparation and Roundup |
| Courses: | Internship Preparation, Prof. Dr. Heiko Körner<br>Internship Roundup, Prof. Ulrich Reich |
| Semester: | 4 |
| Responsible lecturer: | Prof. Dr. Heiko Körner |
| ECTS: | 6 |
| Contact hours: | 4 |
| Preconditions in examination regulations: | Bachelor pre-degree |
| Course contents: | This course improves vocational skills, which are also important for the internship. Topics include managing projects, time and cost planning. Also, the safe handling of MS Office products is intensively trained. |

# Internship Preparation (IB 4P1)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Heiko Körner |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Praxissemester und Abschlussarbeit |
| ECTS: | 3 |
| Objective of the course: | This course deals with the general handling of MS Office products and gives specifically an introduction to the main functions of MS-Excel. Topics include input methods, formulas, chart depictions and search functions. Basic knowledge about the programming in VBA are also taught. |
| Contents: | The course teaches the key skills which are necessary for MS Office products. The focus is on the efficient use of these programs. Afterwards, participants of the lecture are prepared to cope with typical tasks quickly. Also, they are able to use macro scripts to solve certain problems. |
| Kind of work: | The course consists of lectures (50%) and supervised, practical exercises (50%). |
| Recommended reading: | MS-PowerPoint slides, possibly accompanying script for reference, exercises. |

# Internship Roundup (IB 4P2)

| | |
|---|---|
| Name of lecturer: | Prof. Ulrich Reich |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Praxissemester und Abschlussarbeit |
| ECTS: | 3 |
| Objective of the course: | This event provides knowledge in project planning and network technology. Topics include basic concepts according to DIN 69900 and DIN 69905, project definition, project structures, process lists, network creation, network planning (network plans with process nodes, operation arrows and event nodes), time and date calculations, cost planning, deployment optimization, accompanying case studies, and the presentation of a network-program system (currently MS Project for Windows). |
| Contents: | The accumulated knowledge from the student's practice activity will be refurbished. This is supported by an in-depth examination of project planning and management techniques. |

| | |
|---|---|
| Kind of work: | Lecture participation, theoretical exercises, practical exercises in team work on the computer. |
| Recommended reading: | Lecture manuscript (22 pages) in paper and electronic form, tabel notes, foils, DIN 69900 to DIN 69905. |

# Internship (IB 4PX0)

| | |
|---|---|
| Course title: | Internship |
| Courses: | Internship, Prof. Klaus Gremminger |
| Semester: | 4 |
| Responsible lecturer: | Prof. Klaus Gremminger |
| ECTS: | 24 |
| Preconditions in examination regulations: | Bachelor pre-degree |

## Internship (IB 4PX1)

| | |
|---|---|
| Name of lecturer: | Prof. Klaus Gremminger |
| Type of course: | On-the-job training |
| Workload: | 720 hours (0 hours presence, 720 hours self-contained work) |
| GI category: | Praxissemester und Abschlussarbeit |
| ECTS: | 24 |
| Objective of the course: | |
| Contents: | |
| Kind of work: | |
| Recommended reading: | |

# Software Engineering and Distributed Information Systems (IB 510)

| | |
|---|---|
| Course title: | Software Engineering and Distributed Information Systems |
| Courses: | Softwareengineering Laboratory, Prof. Dr. Thomas Fuchß<br>Software Engineering, Prof. Dr. Thomas Fuchß<br>Distributed Informatik Systems, Prof. Klaus Gremminger |

| | |
|---|---|
| Semester: | 5 |
| Responsible lecturer: | Prof. Dr. Thomas Fuchß |
| ECTS: | 8 |
| Contact hours: | 7 |
| Preconditions in examination regulations: | Bachelor pre-degree |
| Course contents: | Founded on the experiences students have made during their internship, the<br>software engineering module focuses on the development of large software systems.<br><br>This covers the decomposition of remaining tasks as well as the evaluation of<br>appropriate architectures. Furthermore they obtain the competence to describe<br>their decisions using standard tools and methodologies. |

# Softwareengineering Laboratory (IB 511)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Thomas Fuchß |
| Type of course, Contact hours: | Laboratory course, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | This course project intensifies the techniques for a structured software development<br>and improves the ability to work in teams. |
| Contents: | Accompanying the software engineering lecture this course project covers a complete<br>step in a modern software development process. Beginning with requirement engineering<br>and analysis, central use cases are designed and finally implemented in Java.<br>By this students learn more than facts, they get experiences and they understand<br>the meaning of terms like architecture-oriented, iterative, incremental, or component-based. |
| Kind of work: | Attended teamwork |

Recommended reading: Slides, textbooks, and other literature:

- Craig Larman. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Designand Iterative Development, 3. ed. - Upper Saddle River, NJ: Prentice Hall, 2004.
- I. Jacobson, G. Booch, and Rumbaugh. The unified software development process - Reading, Mass.: Addison-Wesley, 1999.
- Jim Arlow, Ila Neustadt. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005.
- Bernd Oestereich. Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003.
- Bernd Oestereich. Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien : Oldenbourg, 2006.
- OMG Object Managment Group. UML 2.1.1 Superstructure Specifcation - Needham Ma: OMG, 2007.

## Distributed Informatik Systems (IB 512.a)

Name of lecturer: Prof. Klaus Gremminger

Type of course, Contact hours: Lecture, 3 SWS

Workload: 90 hours (45 hours presence, 45 hours self-contained work)

GI category: Informatik

ECTS: 3

Objective of the course:

Contents:

Kind of work:

Recommended reading:

## Software Engineering (IB 512.b)

Name of lecturer: Prof. Dr. Thomas Fuchß

Type of course, Contact hours: Lecture, 2 SWS

Workload: 60 hours (30 hours presence, 30 hours self-contained work)

GI category: Informatik

| | |
|---|---|
| ECTS: | 2 |
| Objective of the course: | The course qualifies the students to participate in a team developing large software systems. They gain the ability to cut down a large task in smaller peaces, and to solve each sub task using modern object oriented techniques. |
| Contents: | The course "software engineering" concentrates on methods and techniques for the structured development of large software systems. Beyond the repetition of well known object oriented concepts, the focus lies on establishing the fundamentals of modern and agile software development process. Based on their experiences made during internship, the students discover the real challenges associated to such a development process. The lecture is accompanied by a course-project, to gain experiences in practice. This covers agile and component based development techniques, containing requirement engineering, analysis, and design as well as an prototypical implementation of the software system in java. |
| Kind of work: | The lecture will take the form of seminars with exercises. |
| Recommended reading: | Slides, textbooks, and other literature:<br>• Craig Larman. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Designand Iterative Development, 3. ed. - Upper Saddle River, NJ: Prentice Hall, 2004.<br>• I. Jacobson, G. Booch, and Rumbaugh. The unified software development process - Reading, Mass.: Addison-Wesley, 1999.<br>• Jim Arlow, Ila Neustadt. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005.<br>• Bernd Oestereich. Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003.<br>• Bernd Oestereich. Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien : Oldenbourg, 2006.<br>• OMG Object Managment Group. UML 2.1.1 Superstructure Specifcation - Needham Ma: OMG, 2007. |

# Databases and Communication Networks 2 (IB 520)

| | |
|---|---|
| Course title: | Databases and Communication Networks 2 |
| Courses: | Databases 2, Prof. Klaus Gremminger<br>Communication Networks 2, Prof. Michael Rotert |
| Semester: | 5 |
| Responsible lecturer: | Prof. Klaus Gremminger |
| ECTS: | 5 |
| Contact hours: | 4 |
| Preconditions in examination regulations: | Bachelor pre-degree |

# Databases 2 (IB 521.a)

| | |
|---|---|
| Name of lecturer: | Prof. Klaus Gremminger |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | |
| Contents: | |
| Kind of work: | |
| Recommended reading: | |

# Communication Networks 2 (IB 521.b)

| | |
|---|---|
| Name of lecturer: | Prof. Michael Rotert |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The students should have knowledge in running and constructing computer networks. |

| | |
|---|---|
| Contents: | The following topics are part of the course: Local Area Network (LAN) protocols with a focus on Ethernet protocol, connecting LANs including hardware components like switches, bridges and routers, LAN-addressing; TCP/IP protocol stack with a focus on the IP layer: IP, ICMP, ARP, RARP, fragmenting, addressing in IP like CIDR as well as autonomous system addressing and routing protocol overview (IGP, EGP, RIP, OSPF, BGP); IP version 6 (IPv6) with its major differences and problems in comparison to IPv4, Proxy mechanism as well as tunneling; TCP layer with port addressing and UDP; access to the Internet via fixed networks, dial up connections, DSL, UMTS, GPRS, WLL as well as the necessary software components and methods (PPP, PPPoE, DHCP, NAT); on the application layer a major topic is the DNS system and name resolver as well as E-Mail security and Internet organizations and their tasks; Throughout the course students will get a lot of examples on life systems as well as some economic and regulatory background. |
| Kind of work: | The course requires the active involvment of students and at the end there will be some trainings<br>There will be tests at the end of the course |
| Recommended reading: | Powerpoint slides as well as hints on the blackboard, internet links for further trainings, recommendations on software training material |

# Computer architecture and Autonomous Systems (IB 530)

| | |
|---|---|
| Course title: | Computer architecture and Autonomous Systems |
| Courses: | Computer architecture, Prof. Dr.-Ing. Albrecht Ditzinger<br>Autonomous Systems, Prof. Dr. Norbert Link |
| Semester: | 5 |
| Responsible lecturer: | Prof. Dr. Norbert Link |
| ECTS: | 4 |
| Contact hours: | 4 |
| Course contents: | The realisation of technical systems is at the teaching core of this module. Two different basic concepts are addressed: Concepts for the software development of autonomous systems and the hardware concepts, which have to be employed to realise such systems. The module spans the corresponding space of system compositions with respect to hardware and software. The module builds upon the previous courses of computer engineering and software engineering. Therefore it can advance the students quite far conceptually as well as concerning the application fields. The focus is on the domain specific conceptual thinking, which supports the decision making competence of the graduates for the realisation of systems. The module also enables the graduates for further scientific |

activities in system development.

# Autonomous Systems (IB 531.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Norbert Link |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The lecture introduces concepts and technologies for the specification of autonomous systems, their formal modelling and basic concepts for the extraction of situation knowledge from data of the system environment. Special emphasis is put on analytical capabilities of the modelling concepts. The students acquire the capabilities to assess, apply and further develop concepts of system behaviour modelling as well as skills to lead autonomous systems projects. |
| Contents: | Software development process for autonomous systems<br>Modelling of system behaviour by means of object oriented analysis<br>• Harel automata and state charts<br>• Petri networks<br>• Scenario based modelling concepts (sequence diagrams, collaboration diagrams and timing diagrams)<br>• Algebraic and graph-based model analysis<br>• Modelling of systems with dominant functional view: data flow diagrams, decision tables and decision trees, structured analysis/real time<br>• Basics of information extraction from data<br>• Situation representation |
| Kind of work: | Class (including training) 50%, self-responsible work 50% |
| Recommended reading: | The matter is presented by means of animated slides and extensive derivations at the blackboard. The presentation is available on the internet. For further study five text books are recommended:<br>• Lehrbuch der Software-Technik / Helmut Balzert Heidelberg; Berlin; Oxford: Spektrum, Akad. Verl., 1996<br>• Real time UML: advances in the UML for real-time systems / Bruce Powel Douglass.- 3. ed., 2. print. Boston [u.a.]: Addison-Wesley, 2006<br>• Petri-Netze: Grundlagen und Anwendungen / Bernd Baumgarten. - 2. Aufl. Heidelberg; Berlin; Oxford: Spektrum, Akad. Verl., 1996.<br>• Pattern classification / Richard O. Duda; Peter E. Hart; David G. Stork. - 2. ed. New York; Weinheim [u.a.]: Wiley, 2001. |

- Real-time UML workshop for embedded systems / by Bruce Powel Douglass Amsterdam; Heidelberg [u.a.]: Newnes, 2007.

## Computer architecture (IB 531.b)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The student will become familiar with current processor architectures and concepts. This will include an understanding of the typical "sysetm on a chip" concept. The student will have the necessary knowledge to develop a processor selection criteria based upon requirements. |
| Contents: | Processor classification<br>Memory heirarchies<br>Main memory modules and identification codes, Pros and cons of various modules, applications and compatabilities<br>Cache strategies, associativity and design<br>Processor registers for various architectures<br>Address generation, memory protection and virtual addressing, Pipeline processing and resulting problems, branch prediction, superscalar processors, out of order processing and VLIW architectures.<br>Current processors are provided as examples of processor architectures |
| Kind of work: | Attending the lectures and participating in the exercises. |
| Recommended reading: | |

# Student Research Project (IB 540)

| | |
|---|---|
| Course title: | Student Research Project |
| Courses: | Student Research Projekt, Alle Dozenten<br>Student Research Projekt Colloquium, Alle Dozenten |
| Semester: | 5 |
| Responsible lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger |
| ECTS: | 5 |
| Contact hours: | 4 |

| | |
|---|---|
| Course contents: | During the project work the individual solution of a clearly defined design requirement will emphasized. In addition to the practical work the student will be required to develop documentation which clearly defines their individual work. The student will demonstrate the ability to present resultant work in a colloquial setting. |

## Student Research Projekt (IB 541)

| | |
|---|---|
| Name of lecturer: | Alle Dozenten |
| Type of course, Contact hours: | Hands-on experience, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 4 |
| Objective of the course: | Students will be able to individually solve a practical software program based upon reality based business or technical models. This will include knowledge of the requirements for technical documentation and the ability to present the results to management. |
| Contents: | The project will require individual work to solve problems in both the software and hardware arenas. Normally the work will be comprised of a practical problem, but instead may include software or hardware evaluation or literature research.<br>The student will prepare a final documentation for the project. The format, content, size, etc. will be determined by the project advisor depending upon the requirements set forth in the initial project. The project is concluded by a colloquium in which the student will defend his work. |
| Kind of work: | All work will be individual work and will include basic literature research, system analysis, coding, documentation, and oral presentation. |
| Recommended reading: | |

## Student Research Projekt Colloquium (IB 542)

| | |
|---|---|
| Name of lecturer: | Alle Dozenten |
| Type of course: | Hands-on experience |
| Workload: | 30 hours (0 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 1 |
| Objective of the course: | Student will be required to develop a presentation of the results of project work and will be required to orally defend the project before his peers and professors. |

| | |
|---|---|
| Contents: | The colloquium is the final step in completing the project work. The colloquium will include a description of the project, the work conducted and the final solution. |
| Kind of work: | All work will be individual work and will include the presentation, discussion, defense of the work. |
| Recommended reading: | |

# ERP Systems (IB 550)

| | |
|---|---|
| Course title: | ERP Systems |
| Courses: | ERP Systems, Prof. Dr. Mathias Philipp<br>ERP Laboratory, Prof. Dr. Mathias Philipp |
| Semester: | 5 |
| Responsible lecturer: | Prof. Dr. Mathias Philipp |
| ECTS: | 8 |
| Contact hours: | 6 |
| Preconditions in examination regulations: | Bachelor pre-degree |
| Course contents: | The studentsshall learn to think in business processes on the basis of integrated ERP systems . They shall recognize the mutual dependence of operational functions and thus deepen their basic economical knowledge about processes (horizontal integration). Furthermore the students recognize the necessity of a vertical integration as a precondition for the advancement of ERP systems to management information systems. In addition the students learn architecture, design and development of ERP systems. |

## ERP Systems (IB 551)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Mathias Philipp |
| Type of course, Contact hours: | Lecture, 4 SWS |
| Workload: | 120 hours (60 hours presence, 60 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 4 |
| Objective of the | The students shall learn to think in business processes on the basis of |

| | |
|---|---|
| course: | integrated ERP systems . They shall recognize the mutual dependence of operational functions and thus deepen their basic economical knowledge about processes (horizontal integration). Furthermore the students recognize the necessity of a vertical integration as a precondition for the advancement of ERP systems to management information systems. In addition the students learn architecture, design and development of ERP systems. The lecture is closely linked with the lab exercises. The lab supports the deepened understanding of the lecture contents. |
| Contents: | ERP basics, system integration, system architectures, logistics (material management, production planning and production control, sales and distribution), finance management, project system, strategic information systems, executive information systems, Supply Chain management. |
| Kind of work: | Lecture participation |
| Recommended reading: | Lecture material completely as Powerpoint documents, blackboard notes for interactive development of central problem positions, a main textbook to ERP, a main textbook to SAP |

## ERP Laboratory (IB 552)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Mathias Philipp |
| Type of course, Contact hours: | Laboratory course, 2 SWS |
| Workload: | 120 hours (30 hours presence, 90 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 4 |
| Objective of the course: | The lecture is closely linked with the lab exercises. The lab supports the deepened understanding of the lecture contents. |
| Contents: | Autonomous treatment of 4 case studies (navigation, integrated production planning, controlling, integrated logistics) in the SAP lab. |
| Kind of work: | Lab participation and preparation of lab documentation. |
| Recommended reading: | Extensive material for every lab case study |

# Embedded Software (IB 610)

| | |
|---|---|
| Course title: | Embedded Software |
| Courses: | Embedded Software, Prof. Dr. Dirk Hoffmann<br>Embedded Software Laboratory, Prof. Dr. Dirk Hoffmann |
| Semester: | 6 |

| | |
|---|---|
| Responsible lecturer: | Prof. Dr. Dirk Hoffmann |
| ECTS: | 5 |
| Contact hours: | 4 |
| Preconditions in examination regulations: | Internship (IB 4PX0) |
| Course contents: | The courses of this module teach the students the fundamental concepts about embedded systems. After completion, students understand the differences between standard software and embedded software. Furthermore, they will be able to analyze, design, and implement a simple automotive ECU. |

# Embedded Software (IB 611)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Dirk Hoffmann |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | After having successfully completed the course, the students should<br>• know the architecture principles of automative ECUs<br>• understand bus-based communications<br>• be able to write low-level C-code for automative applications |
| Contents: | The lecture introduces software development methods for embedded real time systems. Embedded systems within the meaning of this lecture are systems that are controlled by computer software and are part of a larger system whose primary function is not compute-oriented. For real-time systems, the result has to be computed within a specified time frame. In particular, topics from the following areas are covered: Design and architecture of automotive ECUs, bus architectures, Embedded C. |
| Kind of work: | Lecture |
| Recommended reading: | Slides, blackboard, exercise sheets |

# Embedded Software Laboratory (IB 612)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Dirk Hoffmann |
| Type of course, | Laboratory course, 2 SWS |

| | |
|---|---|
| Contact hours: | |
| Workload: | 90 hours (30 hours presence, 60 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 3 |
| Objective of the course: | After having successfully completed the course, the students should be able to design and implement an CAN-bus based automotive ECU |
| Contents: | With the help of the modeling tool CANoe the participants design a control unit in the field of automotive electronics. The project also includes tasks from the field of microcontroller programming and software quality assurance. |
| Kind of work: | Practical work |
| Recommended reading: | Software and hardware tools für designing automative ECUs |

# Computer Graphics with Laboratory (IB 620)

| | |
|---|---|
| Course title: | Computer Graphics with Laboratory |
| Courses: | Computer Graphics, Prof. Dr. Peter A. Henning<br>Computer Graphics Laboratory, Prof. Dr. Peter A. Henning |
| Semester: | 6 |
| Responsible lecturer: | Prof. Dr. Peter A. Henning |
| ECTS: | 4 |
| Contact hours: | 3 |
| Preconditions in examination regulations: | Internship (IB 4PX0) |
| Course contents: | Visual cognition and its creation through modern computer graphics are understood in basic theoretical details as well as in practice. |

## Computer Graphics (IB 621)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Peter A. Henning |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |

| | |
|---|---|
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | Visual cognition and its creation through modern computer graphics are understood in basic biophysical and mathematical detail. Translation into languages of computer science is understood on a theoretical basis. |
| Contents: | Coordinate systemy and their transformations, models and their projection, transformation pipeline. Light and color, color models in computer graphics, coding of colors and brightness, lighting and shading models, visual realism, non-photorealistic rendering. Graphics processors, displays and human interface devices |
| Kind of work: | Participation in the lecture and in online tests |
| Recommended reading: | Powerpoint transparencies in lecture, electronic whiteboard stored on the ILIAS Server, electronic learning modules as additional material.<br><br>Book:<br><br>Henning, Taschenbuch Multimedia.<br>Further literature list at beginning of course. |

## Computer Graphics Laboratory (IB 622)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Peter A. Henning |
| Type of course, Contact hours: | Laboratory course, 1 SWS |
| Workload: | 60 hours (15 hours presence, 45 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | Basic skills of 3D modeling, coordinat etransformations and visual realism are learned using the Virtual Reality Modeling language VRML and X3D. The usage of OpenGL as graphics API is learned in elementary examples. |
| Contents: | Graphical primitives, polygonalmodels, transformations. Coloring, lighting and textures. Animation through sensors and interpolators.<br><br>Elements of OpenGL: Vertices, polygons, transformation matrices. Lighting and textures |
| Kind of work: | Presence required, solution of lab problems |
| Recommended reading: | Material from the lecture |

# Communication Competence (IB 630)

| | |
|---|---|
| Course title: | Communication Competence |
| Courses: | Seminar, Alle Dozenten<br>Presentation, Alle Dozenten |
| Semester: | 6 |
| Responsible lecturer: | Prof. Dr. Lothar Gmeiner |
| ECTS: | 7 |
| Contact hours: | 6 |
| Preconditions in examination regulations: | Internship (IB 4PX0) |
| Course contents: | The student should learn how a common, computer science-related content will be refurbished for a specific group of audiants. Additionnally he should have learned how to give his presentation and defend it. |

# Seminar (IB 631)

| | |
|---|---|
| Name of lecturer: | Alle Dozenten |
| Type of course, Contact hours: | Seminar, 6 SWS |
| Workload: | 180 hours (90 hours presence, 90 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 6 |
| Objective of the course: | The student should learn how a common, computer science-related content will be refurbished for a specific group of audiants. Additionnally in IB 632 he should have learned how to give his presentation and defend it. |
| Contents: | Each participant of the seminar creates under the guidance of a supervising faculty staff a written report in housework. The contents of the report should be computer science related. Based on the report suitable presentation techniques (slides, video sequences, programmed examples) are selected. Each participant individually presents his report followed by a discussion. The seminar topics are classified into thematic groups. Besides the technical problem the student has to learn how to do 'self-marketing'. The assessment of the student is based on the following criteria: degree of difficulty, quality of written preparation; didactically skillful presentation. |
| Kind of work: | Meetings with the faculty supervisor; eventually experimental studies, literature refurbishment; presenting the work-out; defend the own presentation; active participation in discussing the presentations of others. |

| | |
|---|---|
| Recommended reading: | Depends on the topic |

## Presentation (IB 632)

| | |
|---|---|
| Name of lecturer: | Alle Dozenten |
| Type of course: | Seminar |
| Workload: | 30 hours (0 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 1 |
| Objective of the course: | The student should have learned in IB 631 how a common computer science-related content will be refurbished for a specific group of audiants. Here Additionnally he should have learned how to give his presentation and defend it. |
| Contents: | A students creates under the guidance of a supervising faculty staff the topic, prepared in IB631. He should learn how to construct a presentation, tailored to an specific group of audiants. Additionally he/she has to give his presentation and successfully defend it in a discussion with the audience He presents his content individually in the context of a lecture with an closing discussion. Besides the technical problem the student has to learn how to do 'self-marketing'. The assessment of the student is based on the following criteria: compliance with the requirements of time, didactically skillful presentation, discussion strength. |
| Kind of work: | Presenting the work-out; defend the own presentation; active participation in discussing the presentations of others. |
| Recommended reading: | Depends on the topic |

# Key Qualification (IB 640)

| | |
|---|---|
| Course title: | Key Qualification |
| Courses: | Presentation techniques, Antje Pelzer<br>Intercultural Communication, Prof. Dr. Ingrid Rose-Neiger<br>Law, RA Mario Stumpf |
| Semester: | 6 |
| Responsible lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| ECTS: | 6 |
| Contact hours: | 6 |
| Preconditions in | <= 4; siehe § 43-I/b (7) |

| | |
|---|---|
| examination regulations: | Internship (IB 4PX0) |
| Course contents: | The job marked has an increased demand for graduates with certain key skills. In the context of globalization the most important skills are the ability to communicate with people of other culture groups and basic knowledge of laws to write contract documents. The third important capability the students will learn is a good self-manifestation to present their work results in an optimal manner. |

# Intercultural Communication (IB 641)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Ingrid Rose-Neiger |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | The students learn to apply intercultural competence as a strategic advantage in international competition. |
| Contents: | • Central aspects of intercultural communication (e.g. cultural determined standards, behaviors, values, verbal and non verbal communication) with special interest in differences between object oriented cultures such as Germany and relationship-oriented cultures such as China and India<br>• Influence of different cultural standards on international business relations (e.g. Business preparation, negotiations, personnel management, decision making, conflict resolution etc.)<br>• Empirical investigations (e.g. Geert Hofstede, Fons, Trompenaars etc.)<br>• Case studies from different cultural areas (e.g. Germany, France, the USA, Japan, China, India etc.) |
| Kind of work: | Lectures and practical exercises |
| Recommended reading: | PowerPoint slides, exercises, continuative information on the Web side of this lecture |

# Presentation techniques (IB 642)

| | |
|---|---|
| Name of lecturer: | Antje Pelzer |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |

| | |
|---|---|
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | Optimal representation of own working results, good self-manifestation |
| Contents: | To exist in the political, social, economical and cultural living nowadays the students must be able to held speeches and to participate in discussions without stoppages. This seminar shows how to express oneself independently of a concrete text. |
| Kind of work: | Lectures and practical exercises |
| Recommended reading: | PowerPoint slides |

## Law (IB 643)

| | |
|---|---|
| Name of lecturer: | RA Mario Stumpf |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | The students learn legal basics to write and to judge contracts. |
| Contents: | • Introduction to the right<br>• That “Bürgerliches Gesetzbuch” (BGB)<br>• The “Handelsgesetzbuch” (HGB)<br>• The judicial procedure |
| Kind of work: | Lecture participation, lecture preparation, exam preparation |
| Recommended reading: | Script |

# Selected Chapters Computer Science 1 (IB 650)

| | |
|---|---|
| Course title: | Selected Chapters Computer Science 1 |
| Courses: | Network Security, Dipl. Inform. Michael Fischer<br>Softwareengineering Special Chapters, Prof. Dr. Thomas Fuchß<br>Robotics, Dr. Michael Haag<br>Business Intelligence, Prof. Dr. Uwe Haneke |

| | |
|---|---|
| | Business Process Management, Prof. Dr. Uwe Haneke<br>Advanced Embedded Software, Prof. Dr. Dirk Hoffmann<br>Pattern Recognition, Prof. Dr. Norbert Link<br>Network Security, Dipl. Inform. Georg Magschok<br>IT Consulting, Prof. Dr. Mathias Philipp<br>ERP Special Chapters, Prof. Dr. Mathias Philipp<br>Graphical User Interfaces, Prof. Dr.-Ing. Holger Vogelsang |
| Semester: | 6 |
| Responsible lecturer: | Prof. Dr. Lothar Gmeiner |
| ECTS: | 8 |
| Contact hours: | 8 |
| Preconditions in examination regulations: | §43 (3) |
| Course contents: | The student should be able to lay his emphasis on individual interests.<br>He can choose up to four subjects from the following list<br>• Advanced Embedded Software<br>• Business Intelligence<br>• Graphical User Interfaces<br>• Business Process Management<br>• IT Consulting<br>• Pattern Recognition<br>• Network Security<br>• Advanced ERP<br>• Advanced Software Engineering |

# Advanced Embedded Software (IB 651.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Dirk Hoffmann |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | After having successfully completed the course, the students should<br>• know about the differences between CPUs from DSPs<br>• knows the basic terminologies of this area<br>• be able to write small programs for DSPs |
| Contents: | The lecture introduces the concepts of digital signal processors (DSPs). Specifically, the following topics are covered: History, DSP core principles, integer and floating point number representation, digital filter, vertex shader, Low-power design |
| Kind of work: | Lecture |
| Recommended reading: | Slides, blackboard, exercise sheets |

# Business Intelligence (IB 651.b)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Uwe Haneke |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | The development of efficient and interactive information systems is gaining importance for enterprises. Students should be introduced to the special requirements regarding analysis-oriented information systems which are based upon data coming from different operational sources. The lecture aims at a better understanding of the requirements on the interface between business administration and computer science. By introducing state-of-the-art technologies students will be able to make use of possibilities the IT offers when developing such information systems. The data warehouse concept and a generic reference model for a data warehouse system will be of special interest during the lecture. |
| Contents: | Students can apply the theoretical concepts developed during the lecture by working on case studies and the possibility to evaluate different software tools.<br><br>• Introduction and business-management background<br>• The concept of data warehousing<br>• Business Analytics and Balanced Scorecard (BSC)<br>• CRM and Data Mining<br>• Trends in Business Intelligence-Case studies |
| Kind of work: | Lecture combined with exercise sessions and case studies |
| Recommended reading: | PowerPoint slides, exercise-sheets, continuative information on the web-site and in the ILIAS-eLearning-system, access to different BI-tools via VMware server and the SAP competence center.<br><br>Bauer, A., Günzel, H. (Hrsg.) (2004): Data Warehouse-Systeme - Architektur, Entwicklung, Anwendung. dpunkt.Verlag, Heidelberg. |

# Business Process Management (IB 651.c)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Uwe Haneke |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | |
| Contents: | Based on the theoretical fundamentals of business process management students learn to work with business processes by |

using different software-tools such as ARIS or ARENA.

- Defining a business process and types of business processes
- Analyzing business processes
- Modelling business processes
- Tools for modelling business processes
- Simulating business processes with ARENA
- Enterprise SOA: SAP’s vision of a service-oriented-architecture
- KPI’s for the evaluation of business processes

| | |
|---|---|
| Kind of work: | Lecture combined with exercise sessions and case studies |
| Recommended reading: | |

## IT Consulting (IB 651.d)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Mathias Philipp |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | Lecture part: the students get an overview about the international consulting market, learn the basic methods of this branch as well as the main working areas of IT Consulting. Interactive role play in groups: the students are divided into groups. Every group gets very coarse instructions (for example: initial consultation with the management, IT consultant after an enterprise acquisition) as well as an objective (e.g., acquisition of the IT part of the whole project). A group takes over project controlling, especially of the production of the project plan monitoring of the deadlines of the other groups. On the basis of these instructions every group compiles a role play of their own and reports this. The "passive" groups assess the "active group" on the basis of checklists. Consulting Case Studies: Starting with the hypotheses that prospective advisers must be in the position to solve specific cases quickly and effectively and that it is typical for the consulting industry to choose new applicants with the help of case studies, every student has to execute a small case study. After a short preparation time he has to present his suggested solution as professionally as possible. |
| Contents: | Consulting market, basic methods and analysis tools, peculiarities of IT consulting, basis types of case studies. |
| Kind of work: | Participation lecture, development of an interactive role play in the group, individual execution of a short case study. |
| Recommended reading: | Lecture material completely as pdf documents, blackboard notes for interactive development of central problem positions, instructions for interactive role play and case study material |

## Network Security (IB 651.e)

| | |
|---|---|
| Name of | Dipl. Inform. Georg Magschok |

| | |
|---|---|
| lecturer: | Dipl. Inform. Michael Fischer |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | After having sucessfully completed this course, the student should have<br>• a wide overview of network security topics<br>• Knowledge of preventive solutions in depth |
| Contents: | Technological and topological mechanisms for securingnetworks, attack patterns and defense mechanisms againstthem. Basics of, variants of and defense against malicioussoftware. Analysis and judgement of security mechanismsand related activities. Excercies at the end of each semester provide practicalexperience in dealing with security topics. |
| Kind of work: | Presentation with a lot of room for discussions andinteraction. Finalized by a hands-on session. |
| Recommended reading: | |

# Robotics (IB 651.f)

| | |
|---|---|
| Name of lecturer: | Dr. Michael Haag |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 2 |
| Objective of the course: | The course aims to provide an overview into the range of applications of industrial robots, and into the design and functionality of robot controls |
| Contents: | Fields of application of industrial and service robots, kinematic types, coordinate transformation, kinematic modelling of manipulators, track design, sensorics, control architecture (hardware and software), methods of programming, programming languages |
| Kind of work: | Lecture in form of seminar |
| Recommended reading: | Lecture Notes and Literature |

# ERP Special Chapters (IB 651.g)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Mathias Philipp |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |

| | |
|---|---|
| Objective of the course: | The students learn in workshops from the example of a post-merger IT integration the method of analysing operational and organisational structures of a new enterprise. In doing so they practice the handling of incomplete or inconsistent informations. The students recognize the interdependence between system or customizing decisions and enterprise organization.<br><br>With the example of an enterprise acquisition the students recognize that next to technical and organizational hard factors also soft factors are crucial for the success of an integration project. |
| Contents: | Enterprise analysis, software choice, system integration, basics of customizing, small development task in ABAP in addition to an ABAP introduction, optional: project office: integrated project and service processing with SAP R / 3 PS |
| Kind of work: | Lecture, workshops, lab:<br><br>Case study based participation in group oriented workshops about enterprise analysis, presentation of group results, independent implementation of the analysis results of into SAP by appropriate system customizing in the lab. Independent treatment of another lab task (e.g., ABAP course, case study project office) |
| Recommended reading: | Lecture material completely as pdf documents, blackboard notes for interactive development of central problem positions, extensive material for every case study. |

# Softwareengineering Special Chapters (IB 651.h)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Thomas Fuchß |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The students gain experiences with a variety of design patterns and learn how to apply these in the context of modern software development processes, to increase the readability, maintainability and performance of software systems. |
| Contents: | The course focuses on fundamental object-oriented design methods with an emphasis on design patterns and model driven concepts. The students learn to recognize, to know when to use, and to apply design patterns in varying situations in the context of an evolutionary development process. Furthermore the ability of an axiomatic rule base application of patterns, within a model driven approach, are discussed. |
| Kind of work: | The lecture will take the form of seminars with exercises. |
| Recommended reading: | Slides, textbooks, and other literature:<br>• Gamma, Erich et. al. Entwurfsmuster: Elemente wiederverwendbarer objektorientierter Software - München : |

Addison-Wesley, 2001.
- Buschmann, Frank. A system of patterns (Pattern-Oriented Software Architecture Volume 1) - John Wiley & Sons. 1996.
- Schmidt, Douglas C. Patterns for concurrent and networked objects (Pattern-Oriented Software Architecture Volume 2) - John Wiley & Sons. 2000.
- Michael Kircher, Prashant Jain. Patterns for Resource Management (Pattern-Oriented Software Architecture Volume 3) - John Wiley & Sons. 2004.
- Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. A Pattern Language for Distributed Computing (Pattern-Oriented Software Architecture Volume 4) - John Wiley & Sons. 2007.
- Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. On Patterns and Pattern Languages (Pattern-Oriented Software Architecture Volume 5) - John Wiley & Sons. 2007.
- Fowler, Martin. Analysemuster: wiederverwendbare Objektmodelle: Ein Pattern-Katalog für Business-Anwendungen - Addison-Wesley-Longman. 1999.
- OMG Object Managment Group. Meta Object Facility (MOF) Specification - Version 1.4: OMG, 2002.

# Pattern Recognition (IB 651.i)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Norbert Link |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 2 |
| Objective of the course: | Based on decision theory, the basic algorithms of pattern recognition are derived. Their use is demonstrated with sample applications. The goal is an understanding of base technologies, capabilities and operating conditions of pattern recognition algorithms as well as insight in methods of assessment and improvement of features. The listeners shall be capable to select and apply the best suited pattern recognition algorithms for specific applications, to find optimal algorithm combinations and adaptations and to develop new algorithms |
| Contents: | Risk minimisation<br>Baysian decision theory<br>Decision functions<br>Perceptrons<br>Linear machines<br>Multi-Layer-Perceptrons<br>k-Nearest-Neighbor classifiers<br>Support vector machines<br>Feature assessment via distance and separability measures<br>Principal component analysis |
| Kind of work: | Class (including training) 50%, self-responsible work 50% |

| | |
|---|---|
| Recommended reading: | The matter is presented by means of animated slides and extensive derivations at the blackboard. The presentation is available on the internet. For further study four text books are recommended:<br>• Pattern classification : a unified view of statistical and neural approaches / Jürgen SchürmannNew York [u.a.] : Wiley & Sons, 1996.<br>• Pattern classification / Richard O. Duda ; Peter E. Hart ; David G. Stork. - 2. ed.New York ; Weinheim [u.a.] : Wiley, 2001.<br>• Pattern recognition / Sergios Theodoridis and Konstantinos Koutroumbas. - 3. ed.Amsterdam ; Heidelberg[u.a.] : Elsevier Academic Press, 2006.<br>• Learning with Kernels : support vector machines, regularization, optimization, and beyond / Bernhard Schölkopf ; Alexander J. SmolaCambridge, Mass. [u.a.] : MIT Press, 2002. |

## Graphical User Interfaces (IB 651.k)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | The students learn to build user interfaces for fat clients. The primary goals of the lecture are the creation of user interfaces and architectural questions like the separation of user interface and business logic as well as the special problems of multithreading in interactive applications. |
| Contents: | The lecture first deals with Swing and the Swing Application Framework, which uses Swing as its basis. The most important topics are the model-view-controller pattern, layout management and event handling using the observer pattern. Based upon this techniques advanced technologies like renderers and editors are presented. Other topics are internationalization and multithreading in the context of user interfaces. The last part of the Swing introduction shows the separation of user interface and business logic using different architectural patterns and a small framework. |
| Kind of work: | Lecture preparation, exam preparation, implementing the bonus exercise, 30% of the lecture is held as a computer exercise |
| Recommended reading: | Books and Web sites:<br>• J. Zukowsky, Definitive Guide to Swing, Apress, 2005<br>• Java-Tutorial, http://java.sun.com/docs/books/tutorial/index.html<br>• JDK-Referenz , http://java.sun.com/javase/reference/api.jsp |

# Selected Chapters Computer Science 2 (IB 710)

| | |
|---|---|
| Course title: | Selected Chapters Computer Science 2 |

| | |
|---|---|
| Courses: | Project Management, Prof. Dr. Uwe Haneke<br>Multimedia (Blended Learning), Prof. Dr. Peter A. Henning<br>Software Quality, Prof. Dr. Dirk Hoffmann<br>Autonomous Systems Labor, Prof. Dr. Norbert Link<br>Teamteaching, Prof. Dr.-Ing. Holger Vogelsang |
| Semester: | 7 |
| Responsible lecturer: | Prof. Dr. Lothar Gmeiner |
| ECTS: | 8 |
| Contact hours: | 8 |
| Preconditions in examination regulations: | §43 (4) |
| Course contents: | The student should be able to lay his emphasis on individual interests.<br>He can choose up to four subjects from the following list<br>• Autonomous Systems Lab<br>• Multimedia Studies (Blended Learning)<br>• Project Management<br>• Quality Assurance<br>• Teamteaching |

# Multimedia (Blended Learning) (IB 711.a)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Peter A. Henning |
| Type of course, Contact hours: | Project lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 2 |
| Objective of the course: | Compression, transport and processing of multimedia data streams (audio and video) is understood. |
| Contents: | Cognition of audio and movement, lossy data compression, motion estimation. Graphics and audio design. Media integration using SMIL |
| Kind of work: | Participation in three presence blocks, working through online course material, participation in online tests |
| Recommended reading: | Powerpoint transparencies in lecture, electronic whiteboard stored on the ILIAS Server, electronic learning modules as main material.<br>Book:<br>Henning, Taschenbuch Multimedia.<br>Further literature list at beginning of course. |

# Autonomous Systems Labor (IB 711.b)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Norbert Link |
| Type of course, Contact hours: | Project lecture, 2 SWS |

| | |
|---|---|
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Mathematische und naturwissenschaftlichtechnische Grundlagen |
| ECTS: | 2 |
| Objective of the course: | The lab course applies the concepts and technologies of the lecture on autonomous systems in practical projects. The whole software development cycle of autonomous systems is passed through. Furthermore procedures for the extraction of situation information from data are applied and practiced. Special emphasis is put on the evaluation of the concepts. The students deepen their power of judgement with respect to the applicable concepts in the domain. They acquire the capabilities to deploy the concepts in a goal-oriented way and to plan and manage development projects in this field. |
| Contents: | Project 1: Implementation of an image-processing-based handling system, which performs transport activities on the basis of information extracted from a digital video camera<br>Project 2: Implementation of the core functionality of an aircraft docking guidance system, which directs aircraft to their respective stopping position at the airport gate<br>Project 3: Autonomous navigation, obstacle avoidance and object following with robots |
| Kind of work: | Theoretical familiarisation, practical work, reporting, partly as self-responsible work |
| Recommended reading: | Lecture notes, task descriptions, project guidelines and FAQs, all accessible via the internet. Handbooks and relevant literature is available on site and for homework in the library. |

# Project Management (IB 711.c)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Uwe Haneke |
| Type of course, Contact hours: | Project lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | Students will be introduced to the main concepts of project management. As most students will start their professional career by working in IT-projects, it is essential for them to have the necessary know-how before entering labour market. |
| Contents: | The lecture focuses mainly on practice oriented project management and new procedure models like Scrum.<br>• Introduction to IT project management<br>• Procedure models in IT project management<br>• Defining a project<br>• The project plan: the heart of the project<br>• Getting started: Initialisation of the project<br>• Project controlling<br>• The final words: how to complete a project |
| Kind of work: | Blocked course; lecture with exercises and case studies; eLearning |

| | |
|---|---|
| | module in preparation of the course |
| Recommended reading: | PowerPoint slides, exercise-sheets, eLearning module in the ILIAS-eLearning-system, continuative information on the web-site |

## Software Quality (IB 711.d)

| | |
|---|---|
| Name of lecturer: | Prof. Dr. Dirk Hoffmann |
| Type of course, Contact hours: | Lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Informatik |
| ECTS: | 2 |
| Objective of the course: | After having successfully completed the course, the students should<br>• know how to increase the quality of software code<br>• be prepared for working in industrial settings<br>• know about important quality assurance software tools and concepts |
| Contents: | The lecture covers practical aspects from the field of software quality assurance. First, the typical sources of program errors are introduced and solutions are discussed. Subsequently, methods and techniques are introduced that help to improve the quality of industrial sized software applications. The lecture covers the central aspects from the areas of constructive and analytical quality assurance. |
| Kind of work: | Lecture |
| Recommended reading: | Slides, blackbord, exercise sheets |

## Teamteaching (IB 711.e)

| | |
|---|---|
| Name of lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| Type of course, Contact hours: | Project lecture, 2 SWS |
| Workload: | 60 hours (30 hours presence, 30 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 2 |
| Objective of the course: | This lecture gives the students the opportunity to train their skills in the field of teaching and/or organization. |
| Contents: | The concrete tasks are formulated by different lecturers. They can consist of teaching or organizational parts. A tutor can advise exercises, write lessons or correct house work under the supervision of a lecturer. He also can organize excursions for several days' duration and exhibitions. |
| Kind of work: | • Preparation of a tutorial, support of student groups<br>• Organisation of events |
| Recommended reading: | Depends on the concrete task, supplied by a lecturer |

# Scientific Working (IB 720)

| | |
|---|---|
| Course title: | Scientific Working |
| Courses: | Scientific Working, Alle Dozenten |
| Semester: | 7 |
| Responsible lecturer: | Prof. Dr.-Ing. Holger Vogelsang |
| ECTS: | 5 |
| Contact hours: | 3 |
| Preconditions in examination regulations: | §43 (4) |
| Course contents: | This module enables the students to solve a realistic problem self-dependent by applying scientific and practical methods. |

## Scientific Working (IB 721)

| | |
|---|---|
| Name of lecturer: | Alle Dozenten |
| Type of course, Contact hours: | Lecture, 3 SWS |
| Workload: | 150 hours (45 hours presence, 105 hours self-contained work) |
| GI category: | Sonstige fachübergreifende Grundlagen und überfachliche Schlüsselkompetenzen |
| ECTS: | 5 |
| Objective of the course: | The students learn to understand the method oriented approach and the principles of scientific research in computer science. They will know how to find academic literature, how to read and understand it and how to use it for their own work. The students will be able to write a scientific thesis with the support of a lecturer. |
| Contents: | Methods of scientific work in computer science, usage of academic literature (investigation, evaluation, citation), writing a scientific thesis (formulation of the subject, way of looking at a problem, structuring, quality assurance) |
| Kind of work: | Self-dependent introduction into the subject, structuring the work and discussion with a lecturer |
| Recommended reading: | Documentation for structuring the thesis and citations<br>Literature:<br>• "Informatik-Handbuch" von Peter Rechenberg, Gustav Pomberger, Hanser Fachbuch, 2006, ISBN: 3446218424<br>• "Die schriftliche Arbeit - kurz gefasst" von Jürg Niederhauser, Bibliographisches Institut, Mannheim, 2006, ISBN: 3411042346 |

# Thesis with Colloquium (IB 730)

| | |
|---|---|
| Course title: | Thesis with Colloquium |
| Courses: | Thesis, Alle Professoren<br>Thesis Defense, Alle Professoren |
| Semester: | 7 |
| Responsible lecturer: | Prof. Dr.-Ing. Albrecht Ditzinger |

| | |
|---|---|
| ECTS: | 15 |
| Preconditions in examination regulations: | <= 4; siehe § 43-I/b (7)<br>Min. 120 CP aus dem Hauptstudium<br>Internship (IB 4PX0) |
| Course contents: | During the thesis phase the individual will demonstrate that s/he has the basic knowledge and ability to solve a complex practical problem or work on a research project in a specific timeframe using the scientific method, research in the specific field of interest. The student will be required to structure the problem, conduct the research, and develop a solution using PERT principles. The student will be required to orally present and defend the results. |

# Thesis (IB 731)

| | |
|---|---|
| Name of lecturer: | Alle Professoren |
| Type of course: | Thesis |
| Workload: | 420 hours (0 hours presence, 420 hours self-contained work) |
| GI category: | Praxissemester und Abschlussarbeit |
| ECTS: | 14 |
| Objective of the course: | The thesis will demonstrate that the student has the basic knowledge and ability to solve a complex practical problem or work on a research project in a specific timeframe using the scientific method, research in the specific field of interest. This will include structuring the problem, conducting the research, and the development of a solution using PERT principles. The student will be required to orally present and defend the results. |
| Contents: | The thesis may address any subject within the field of computer science and will be defined by the subject agreed upon by the student and the advisor. |
| Kind of work: | All work will be individual work and will include basic literature research, system analysis, coding, documentation, and oral presentation. |
| Recommended reading: | |

# Thesis Defense (IB 732)

| | |
|---|---|
| Name of lecturer: | Alle Professoren |
| Type of course: | Seminar |
| Workload: | 30 hours (0 hours presence, 30 hours self-contained work) |
| GI category: | Praxissemester und Abschlussarbeit |
| ECTS: | 1 |
| Objective of the course: | Student will demonstrate ability to develop, research, and defend a complex problem and solution. |
| Contents: | The thesis results will be presented. This will be followed by questions concerning the specific points within the thesis. Lastly, multiple questions related to the overall field of computer science will be asked. |
| Kind of work: | Oral defense. |
| Recommended reading: | |