Hochschule Heilbronn
Technik • Wirtschaft • Informatik
Heilbronn University

Course Catalogue

Master Course in

"Software Engineering and Management"

leading to

Master of Science (M.Sc.)

(MSEM)

- **Date first offered:** Planned for 1st September, 2008
- **Head of program: (responsible)** Dr. Christine Reck
- **Date edited:** 15 July 2007
- **Version of module handbook:** 2.1

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Module M1 – Software Engineering 1

Responsible for this module:

Prof. Dr. Alois Heinz, Prof. Dr. Dominikus Herzberg

Prerequisites:

Profound knowledge in computer science on the level of a bachelor's degree or equivalent is presumed. This includes good programming skills in at least one modern programming language, ability of abstract logical thinking and sound knowledge of mathematics.

Basic data:

Status	Se-mester	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	1	1 Sem.	every year		8	90	160	10

Module Objectives:

In this module we focus on three aspects of software construction: Computational problems must be mapped to efficient routines in distributing and processing them. That is the algorithmic aspect. On the other hand, software needs to be partitioned and organized in a well thought-through manner. That is the architecture aspect. In addition, a software engineer should be aware of some of the many programming and modelling approaches for software development, the paradigm aspect. Consequently, the objectives fall into three categories:

Algorithm Theory: The students have sound knowledge of the concepts and methods for devising and analyzing efficient algorithms in various areas of application. They have practice in deploying these methods and are able to apply them in new contexts.

Software Architecture: The students know what software architecture is about and why it is important in software engineering. They can read architecture diagrams and are capable to model simple architectures themselves. They can translate architectural concepts to the code level.

Paradigms in Software Development: The students know some of today's paradigms in software development and understand the consequences a certain paradigm has on structuring and building software. Applying a paradigm on a given software problem, they can analyze pros and cons.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours H	Stu-dent led work h	Evidence of achieve-ment
M1.1 Algorithm Theory (Prof. Dr. Heinz)	▪ Randomized algorithms & data structures ▪ Dynamic programming ▪ Greedy algorithms ▪ Graph algorithms ▪ Heuristic optimization ▪ Online/offline algorithms ▪ Self-modifying data structures ▪ String indexing and search	Interactive lecture/ Laboratory/ Homework	Week 1 to 15	45	80	5 ECTS LK90
M1.2 Software Architecture (Prof. Dr. Herzberg)	▪ Definition, Purpose and Roles ▪ Elements, Styles, Views ▪ Modeling Software Architecture ▪ From Architecture to Code ▪ Model Driven Architecture ▪ Documenting Architecture	▪ Lectures ▪ Reading Papers ▪ Coding: e.g. developing an architecture framework ▪ Case Study (e.g. architectures for web-based applications, .NET)	Week 1 to 15	22,5	52,5	3 ECTS LA
M1.3 Paradigms in Software Development (Prof. Dr. Herzberg)	Some examples: ▪ Model Driven Development ▪ Aspect-Oriented Programming and Modeling ▪ Generative Programming ▪ Domain Specific Modeling ▪ Constraint Programming ▪ Intentional Programming ▪ Feature Driven Development	▪ Lectures ▪ Reading papers ▪ Exercises: E.g. Studying a paradigm on simple case studies ▪ Investigating and evaluating available tools	Week 1 to 15	22,5	27,5	2 ECTS LA

Usability of the module:

Mandatory module in the Master in Software Engineering and Management programme. The module could be used in other computer science or engineering master's courses.

Allocation of ECTS credits:

The intended number of 10 credit points is assigned only if all examinations have been passed successfully.

Literature/Sources:

- Goodrich, Michael T. and Tamassia, Roberto (2005): Data Structures and Algorithms in Java, 3rd Edition. John Wiley & Sons, Inc.
- Gusfield, Dan (1997): Algorithms on Strings, Trees and Sequences. Cambridge University Press.
- Sedgewick, Robert (2003): Algorithms in Java, Parts 1-4: Fundamental Algorithms, Data Structures, Sorting, Searching, 3rd Edition. Addison-Wesley.
- Sedgewick, Robert (2003): Algorithms in Java, Part 5: Graph Algorithms, 3rd Edition. Addison-Wesley.

- Bass, Len et al. (2003): Software Architecture in Practice, 2nd Ed., Addison-Wesley
- Clements, Paul et al. (2002): Evaluating Software Architectures – Methods and Case Studies, Addison-Wesley
- Clements, Paul et al. (2003): Documenting Software Architectures – Views and Beyond, Addison-Wesley
- Shaw, Mary and Garlan, David (1996): Software Architecture – Perspectives on an Emerging Discipline, Prentice Hall
- Hofmeister, Christine et al. (2000): Applied Software Architecture, Addison-Wesley
- Czarnecki, Krzysztof and Eisenecker, Ulrich W. (2000): Generative Programming – Methods, Tools, and Applications, Addison-Wesley
- Szyperski, Clemens (2002): Component Software – Beyond Object-Oriented Programming, 2nd Ed., Addison-Wesley
- Stahl, Thomas and Voelter, Markus (2006): Model-Driven Software Development: Technology, Engineering, Management, Wiley
- Abdennadher, Slim and Frühwirth, Thom (2003): Essentials of Constraint Programming, Springer
- Filman, Robert E. et al. (2004): Aspect-Oriented Software Development, Addison-Wesley

Module M2 – Engineering Application Domains

Responsible for this module:

Prof. Dr. Jürgen Doneit, Prof. Dr. Volker Stahl

Prerequisites:

Profound knowledge in computer science on the level of a bachelor's degree or equivalent is presumed. This includes good programming skills in at least one modern programming language, ability of abstract logical thinking (predicate calculus) and sound knowledge of mathematics (Linear Algebra, Analysis and Statistics).

Basic data:

Status	Se-mes ter	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	1	1 Sem.	every year		8	90	160	10

Module Objectives:

The students master the essential techniques of knowledge based man machine communication, knowledge representation and machine learning. They are able to implement the corresponding algorithms in software, assess chances and limitations of specific application areas such as consumer electronics, semantic web or natural language dialog systems. They master basic techniques to analyze mass data like text or sensor signals in a knowledge based way, i.e. develop statistical models, classify data (supervised or unsupervised) and extract the relevant information. The Real Time System unit enables the students to implement real time relevant problems in an adapted hardware environment. They can evaluate the realtime needs, like responding time or calculation resources.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours h	Stu-dent led work h	Evidence of achieve-ment
M 2.1 Intelligent Systems (Prof. Dr. Stahl)	▪ Modelling problems with graphs, solving problems with graph search algorithms ▪ Natural language dialog- and inquiry systems ▪ Algorithms and application domains of chatbots ▪ Natural language processing, especially statistical methods. ▪ Foundations of information theory. ▪ Applications: Semantic Web, Information Retrieval, Data Mining, Text Summarization, Machine Translation ▪ Knowledge representation using Description Logic or Frame Logic. Inference Algorithms. ▪ Statistical methods for machine learning, prediction and classification ▪ Linear regression, linear discriminant analysis, decision trees, maximum likelihood estimation, EM algorithm, support vector machines, cluster analysis, PCA	Lecture with integrated exercises **<u>Homework</u>** Preparation and repetition of the lecture, reading the lecture notes. Exercises. Literature work Repetition of prerequisites Programming **<u>Projects (examples)</u>** Development of an intelligent dialog system for a commercial web site, Natural language access to a data base or FAQ, Interacting intelligent characters in a multi user dungeon (MUD) Game program (e.g. checkers which is able to learn) Implementation of a spam filter	Week 1 to 15	45	80	5 ECTS LA
M 2.2 Real Time Systems (Prof. Dr. Doneit)	▪ Introduction to real time problems ▪ Hard real time problems ▪ Latency ▪ Scheduling ▪ Thread synchronization algorithms ▪ Real time project	Lecture with integrated exercises Project work in teams with support, interviews and assessment of interim results.…	Week 1 to 15	45	80	5 ECTS LL

Usability of the module:

Mandatory module in the Master in Software Engineering and Management programme. The module could be used in other computer science or engineering master's courses.

Allocation of ECTS credits:

The intended number of 10 credit points is assigned only if all examinations have been passed successfully.

Literature/Sources:

Submodule 1 (Intelligent Systems)

- Hastie, Trevor and Tibshorani, Robert (2001): The Elements of Statistical Learning, Springer
- Haugeland, John (1985): Artificial Intelligence: MIT Press
- Russell, Stuart and Norvig, Peter (1995): Artificial Intelligence: Prentice Hall
- Winston, Patrick Henry (1992): Artificial Intelligence, Addison-Wesley
- Manning, Christopher D. and Schütze, Heinrich (2003): Foundations of Statistical Natural Language Processing: MIT Press
- Jurafsky, Daniel and Martin, James H. (2000) Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition: Prentice Hall
- Allen, James (1995): Natural Language Understanding: Benjamin Cummings Publishing Company
- Hausser, Roland (1998): Foundations of Computational Linguistics: Springer
- Cover, Thomas M. and Thomas, Joy A. (1991): Information Theory: Wiley Interscience
- Baeza-Yates, Ricardo and Ribeiro-Neto, Berthier (1999): Modern Information Retrieval: Addision Wesley

Submodule 2 (Real Time Systems)

- Tampert (2000): AVR-Risc Microcontroller, Franzis
- S.T: Allworth (1985):Introduction to Real-Time Software Engineering, Mac Millan
- Gadre (2000): Programming and Customizing the AVR Microcontroller: McGraw-Hill
- Hartley, Pirbhai (1988): Strategies for Real-Time System Specification: Dorset House Publishing Company, Incorporated
- Ben-Ari, M. (1982): Principles of concurrent programming: Prentice Hall

Module M3 – Project Management and Leadership

Responsible for this module:

Prof. Dr. Tomas Benz, Prof. Dr. Nicola Marsden, Prof. Dr. Gerald Permantier

Prerequisites:

Some experience in and with software development projects.

Basic data:

Status	Se-mes ter	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	1	1 Sem.	every year		8	90	160	10

Module Objectives:

The most important quality-defining properties of software applications are their usability, their dependability, as well as maintainability and efficiency. In unit M3.1 "Product & Quality Management", students will learn that a defined software development process is the prerequisite for any kind of product management and quality in software products. They will be able to name today's most frequently adapted software processes, to enumerate their advantages and drawbacks.
Students will be able to name up-to-date models for quality management and the maturity of software-producing organizations.
They can identify and work with some of the most widespread tools for the distributed development of software.
Students know and can utilize common means of quality assurance, such as software reviews, product metrics, unit, integration and system tests. Students will know why usability is one of the determining factors for software quality, and what measures are to be taken during development to achieve it. These means are used on development projects from classes in the B.Sc. Software Engineering degree course.

Unit M3.2 is a hands-on, experiential, action learning workshop that exposes students to the models and real-life experience of leadership. Completing the unit, students will

- be able to describe a variety of leadership theories and models and identify important qualities and behaviors of effective leaders
- know how to employ the techniques and behaviors associated with effective leadership
- have practiced leadership techniques and behaviors and have gotten feedback on individual performance in order to identify areas for improvement.
- have reflected their leadership behavior and improved regarding individual and group skills

In Unit M3.3 the students will learn the basic concepts of entrepreneurship and different business models for software. In workshops the students will work out business models for small software companies. On the other hand they will learn to

interpret the consequences of different models for software customers for example licensed software vs. open source vs. application services.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours h	Stu-dent led work h	Evidence of achieve-ment
M3.1 Product and Quality Management	▪ software development processes ▪ models and tools for quality management ▪ means of quality assurance	▪ Lecture ▪ Reading ▪ Presentation by students ▪ Examination of student SW projects ▪ Use of tools	Week 1 to 15	22,5	77,5	4 ECTS LA
M3.2 Management Methods / Leadership	▪ leadership styles and theories ▪ characteristics of effective leaders ▪ relationship building, integrity, and trust ▪ interpersonal effectiveness ▪ conflict management ▪ business meetings ▪ business behavior ▪ performance management	Face-to-face class ▪ interactive lectures ▪ individual student papers ▪ self-assessments ▪ individual, small, and large group practical exercises ▪ discussions ▪ facilitator presentations ▪ application planning	Week 1 to 5 (7,5 contact hours per week)	33,75	41,25	3 ECTS LA
M3.3 Business Models for Software	▪ historic software business model trends ▪ business models for open source software ▪ emerging business models ▪ consequences for customers	Face-to-face class ▪ interactive lectures ▪ individual student papers ▪ self-assessments ▪ individual, small, and large group practical exercises ▪ discussions ▪ facilitator presentations	Week 1 to 15	33,75	41,25	3 ECTS LA

Usability of the module:

Unit M3.1:
Can be integrated in other courses.
Unit M3.2:
Can be integrated in other courses.
Unit M3.3:
Can be integrated in other courses.

Allocation of ECTS credits:

This module forms a mandatory part of the M.Sc. course “Software Engineering and Management” yielding 10 ECTS credits in total. Credits are allocated per unit: unit M3.2 and M3.3 yielding 3 credits each, M3.1 yielding 4 credits. The ECTS credits allocated to this module will not be awarded unless the participants have achieved a pass mark in each unit.

Literature/Sources:

Current literature will be used and is to be published at the beginning of the units. Sources for the projects will either be delivered by the lecturers or researched by the students.

- Sommerville, Ian (2006): Software Engineering, 8th ed. Addison-Wesley.
- Jessica Livingston, Founders At Work: Stories of Startup's Early Days, Computer Bookshops 2007
- Miroslaw Malek, Peter K. Ibach, und Julia Ahlers, Entrepreneurship. Prinzipien, Ideen und Geschäftsmodelle zur Unternehmensgründung im Informationszeitalter, Dpunkt Verlag, 2004

Module M4 – Software Engineering 2

Responsible for this module:

Prof. Dr. Ulrike Jaeger, Prof. Dr. Gerald Permantier, Uwe Kipke

Prerequisites:

Profound knowledge in computer science on the level of a bachelor's degree or equivalent is presumed. Module M1 (Software Engineering 1) is advisable.

Basic data:

Status	Se-mes ter	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	2	1 Sem.	every year		8	90	160	10

Module Objectives:

In real-life interaction with a customer, there are three areas which require increased attention: The problem domain a customer lives in demands advanced techniques in information modelling; a model should preserve as much of the complexity of the problem domain as possible and advisable. Requirements must be uncovered, analyzed, organized, documented and tracked. The usability of a human/machine interface is of paramount importance in this context. Finally, projects must be run, which transform requirements into software applications; often under conditions of uncertainties. Consequently, the objectives fall into three categories:

While Module M1 discusses theory and concepts of software solutions, this module covers the application side of software engineering. Starting with requirements and usability engineering, students now learn how to integrate the necessary domain and application knowledge into a software solution. Risk management and controlling "escort" the project decisions towards a solution that is as close to the application's needs as possible.
After attending the course the participants are able to

- Choose the appropriate mapping of application information to a rich model and implementation that preserves as much of the complexity of the real world as possible and advisable. This includes modelling languages, storage engineering and retrieval functionality.
- Elicit and specify requirements in an organized way, possibly with the aid of tools.
- Draw user interface prototypes and evaluate them.
- Name metaphors and interaction patterns and know their usage in typical applications.
- Set up models for the man-machine communication and the internal architecture of an application.
- Name tools that facilitate the transformation from models to a first structure of the application, to be further developed by programmers.
- Perform different kinds of usability tests with users, evaluate the results, and suggest improvements to the application under review.

- Work in interdisciplinary teams. For tailoring a solution for the application, cognitive and social aspects are of great importance.

Project- and Risk Management and Controlling: From a process viewpoint the topic is divided into four mutually dependent practices: project planning, project monitoring and control, risk management and change request management. The students are able to uncover, analyze and describe requirements, set-up a work break down structure, establish a plan accordingly and audit the planning process. They know how to monitor and control a project and how to do re-planning. The students can manage even outbound risks and formulate and react on change requests with proper management actions.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours h	Stu-dent led work h	Evidence of achieve-ment
M4.1 Information Management	▪ Kinds of Information (structured and unstructured, process, narrative, etc). ▪ Modeling Languages. ▪ Storage Engineering. ▪ Retrieval Languages. ▪ Application Examples.	Lecture, guided projects in teams. Group assignments and individual assessment: • Explore a given topic with help of advisor and literature. • Defend the topic by presentation, implementation and discussion.	Week 1 to 15	45	80	5 ECTS LA
M4.2 Requirements and Usability Engineering	▪ Requirements in a software project ▪ Software specification with the help of templates ▪ Modeling with the Unified Modeling Language ▪ Evaluating models ▪ Using tools for modeling ▪ Automated transformation into code structures ▪ User interface prototypes and their evaluation ▪ Usability testing	▪ Lecture ▪ Reading ▪ Presentations by students ▪ Testing of student SW projects ▪ Use of tools	week 1 to 15	22.5	52.5	3 ECTS LA
M4.3 Project and Risk Management and Project Controlling	▪ Definition of “Project” ▪ Engineering and development models: V-Model, V-Model XT, Agile Methods (e.g. eXtreme Programming), Rational Unified Process (RUP) ▪ Maturity models: CMM(I), SPICE, Six Sigma, IEC 61508 ▪ Project Phases ▪ The concept of “deliverables” ▪ Estimation techniques ▪ Project planning ▪ Project controlling ▪ Risk management ▪ Cost control ▪ Human resources	▪ Lecture ▪ Discussion of real industrial life projects ▪ Case Studies ▪ Exercises	week 1 to 15	22.5	27.5	2 ECTS LA

Usability of the module:

Can be integrated in other courses.

Allocation of ECTS credits:

This module forms a mandatory part of the M.Sc. course “Software Engineering and Management” yielding 10 ECTS credits in total. Credits are allocated per unit: Unit M4.1 yielding 2, M4.2 3, and M4.3 5 credits, respectively. The ECTS credits allocated to this module will only be awarded if the participants have achieved a pass mark in each unit.

Literature/Sources:

- Sommerville, Ian (2006): Software Engineering, 8th ed. Addison-Wesley.
- Maciaszek, L.A. (2005): Requirements analysis and system design, 2nd ed. Addison-Wesley.
- Tidwell, Jennifer (2006): Designing Interfaces. O'Reilly.
- Van Welie, M. and Trætteberg, H. (2000): Interaction Patterns in User Interfaces. Pattern Languages of Programs Conference, Monticello, Illinois 2000.
- John F. Sowa (2002): Knowledge Representation, Brooks, Cole.
- Dieter Fensel, James Hendler, Henry Lebermann, Wolfgang Wahlster (Ed.) (2003): Spinning the Semantic Web, MIT Press 2003.
- Pavel Hruby (2006): Model-Driven Design Using Business Patterns, Springer.
- current publications in the field of information engineering.
- Harold Kerzner (2006): Project Management. A Systems Approach to Planning, Scheduling, and Controlling**,** 9th Ed., Wiley & Sons
- Mary Beth Chrissis, Mike Konrad, Sandy Shrum (2007): CMMI, Guideline for Process Integration and Product Improvement, 2nd Ed., Addisson-Wesley

Module M5 – Change and Strategic Information Management

Responsible for this module:

Prof. Dr. Christine Reck, Prof. Dr. Tomas Benz

Prerequisites:

none

Basic data:

Status	Se-mes ter	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	2	1 Sem.	every year	none	8	90	160	10

Module Objectives:

After attending the course the participants are able to

- Make strategic decisions in the area of IT Service Management. This means
  - They know about the importance of information technology as fundamental competitive factor in enterprises of all branches.
  - They know about the importance of high-quality IT services as competitive advantage.
  - They know best-practises as far as IT Services are concerned.
  - They learn how to organize IT Service Management in an efficient and effective way.

- The students achieve the capability to initiate and guide change processes in the Companies. E.g., they learn
  - How to realize effectively and lasting strategic projects and initiatives
  - How to recognize, rate and influence corporate culture
  - How to analyze the basis of fundamental change projects
  - How to guide change projects using change management tools
  - How to implement new processes or software in the enterprise

- The students know about the fundamental Engineering abilities of an enterprise. They get to know Integrated Process Management and Quantified Process management. They know how to achieve effective Requirements Management, Project Planning, Project Monitoring and Control, and Risk Management. They know how to implement Configuration Management.
- They know about models that support the structuring, the description and the quantification of those abilities, e.g. Best-Practice Models, Staged Maturity Models as well as Methods of Appraisal.
- They examine examples for Process Models, e.g. CMMI, SPICE, or the V-Model.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours h	Stu-dent led work h	Evidence of achieve-ment
M5.1 Change Management	▪ Understanding drivers of strategic changes ▪ To recognize and understand the causes and drivers of opposition or the acceptance to changes ▪ To analyze the factors of success for change processes ▪ To learn procedures for successful changes in enterprises ▪ Tools for change management Case studies like Changing processes in enterprises in establishing new business software	▪ lectures, ▪ guided exercises, ▪ Introduction to project topics, ▪ building of project teams , ▪ explanation of the work mode, ▪ guidance of project work and project meetings, ▪ team supervision ▪ Self-study: ▪ wrap-up of the presented material, ▪ study of literature, ▪ preparation of project meetings etc., ▪ Exercises, recapitulation ▪ Become acquainted with the chosen project topic, ▪ Execution of a team project	Week 1 to 15	22,5	27,5	2 ECTS LR You have to prepare, present and defend a presentation on the team project (kind of an executive summary of the work done)
	▪	▪		***22,5***	***27,5***	***Sum: 50***
M5.2 Strategic Information Management	▪ Monitoring and evaluation of the latest trends in IT Service Management ▪ Judgement of the economic relevance of these trends for enterprises of different branches ▪ Get an understanding of different parts of IT Service Management: o Service Level Management o Financial Management for IT Services o Capacity Management o Availability Management o Service Desk o Incident Management o Problem Management o Configuration Management o Release Management o Security Management etc. ▪ Execution of case studies/final projects	▪ lectures, ▪ guided exercises, ▪ Introduction to project topics, ▪ building of project teams , ▪ explanation of the work mode, ▪ guidance of project work and project meetings, ▪ team supervision ▪ Self-study: ▪ wrap-up of the presented material, ▪ study of literature, ▪ preparation of project meetings etc., ▪ Exercises, recapitulation ▪ Become acquainted with the chosen project topic,	Week 1 to 15	45	80	5 ECTS LR You have to prepare, present and defend a presentation on the team project (kind of an executive summary of the work done)

		▪ Execution of a team project				
		▪		***45***	***80***	***Sum: 125***
M5.3 Process Management	Fundamental Engineering abilities of an enterprise, specifically ▪ Integrated Process Management ▪ Quantified Process Management ▪ Requirements Management ▪ Project Planning ▪ Project Monitoring and Control ▪ Configuration Management ▪ Verification and Integration processes ▪ Risk Management ▪ Supply Chain Management/Supplier Management ▪ Decision Processes ▪ Processes in Quality Assurance and Management Models that support the structuring, the description and the quantification of those abilities ▪ Structure of Process Models o Best-Practice Models o Staged Maturity Models o Methods of Appraisal ▪ Examples for Process Models o CMMI o SPICE o V-Model Execution of case studies/final projects	▪ lectures, ▪ guided exercises, ▪ Introduction to project topics, ▪ building of project teams , ▪ explanation of the work mode, ▪ guidance of project work and project meetings, ▪ team supervision ▪ Self-study: ▪ wrap-up of the presented material, ▪ study of literature, ▪ preparation of project meetings etc., ▪ Exercises, recapitulation ▪ Become acquainted with the chosen project topic, ▪ Execution of a team project	Week 1 to 15	22,5	52,5	3 ECTS LR You have to prepare, present and defend a presentation on the team project (kind of an executive summary of the work done)
		▪		***22,5***	***52,5***	***Sum: 75***
		▪		***90***	***160***	***250***

Usability of the module:

Mandatory module in the second semester of the master's program.

Allocation of ECTS credits:

The intended number of 10 credit points is assigned only if all examinations have been passed successfully.

Literature/Sources:

- Introduction to ITIL, published by TSO (ISBN 0-11-330973-2)
- Alfred Olbrich: ITIL kompakt und verständlich, Vieweg; Auflage: 3., erw. u. verb. Aufl. (Juli 2006), (ISBN: 3834801445)
- Ralf Kneuper : CMMI, Verbesserung von Softwareprozessen mit Capability Maturity Model Integration, dpunkt, 2006
- Dennis M. Ahern, Aaron Clouse, Richard Turner : CMMI Distilled, A Practical Introduction to Integrated Process Improvement, Addison-Wesley, 2006

- Mary Beth Crissis, Mike Conrad, Sandy Shrum: CMMI, Guidelines for Process Integration and Product Improvement, Addison-Wesley, 2007
- Andreas Rausch, Manfred Broy: Das V-Modell XT. Grundlagen, Erfahrungen und Werkzeuge, dpunkt, 2007
- Krüger , Wilfried, Excellence in Change: Wege zur strategischen Erneuerung, Gabler, 2006
- Stolzenberg , Kerstin; Heberle , Krischan: Change Management: Veränderungsprozesse erfolgreich gestalten - Mitarbeiter mobilisieren, Springer, 2006
- Doppler , Klaus; Lauterburg, Christoph; Change Management: den Unternehmenswandel gestalten; Campus, 2005

Module M6 – International Cooperation in Software Engineering

Responsible for this module:

Prof. Dr. Nicola Marsden

Prerequisites:

none

Basic data:

Status	Se-mes ter	Dura-tion	Pro-vi-ded	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	1/2	1 Sem.	every year		8	90	160	10

Module Objectives:

Completing the module students will

- be able to design and carry through software engineering processes in an intercultural context
- can integrate the social, intercultural and the technical process of software development in the context of international remote collaboration
- have a sound understanding of the cultural dimensions of international business and off-shoring
- have developed strategies to conduct cross-cultural business situations successfully – both face-to-face and computer-mediated
- have lead virtual teams and used computer-mediated communication processes considering their implications regarding cognitive, social and communication aspects
- be able to analyse intercultural and virtual communication problems and propose solutions
- can identify major research and theories from computer-mediated communication studies and international management
- be in a position to assess their own intercultural and online behavior
- be aware of ethical, political and organizational sensitivities in cross-cultural and virtual situations

The students transfer their methodological competencies to an international and remote working environment. Thereby they further develop and improve skills such as managing projects, moderating teams, delivering presentations, facilitating decision processes, generating ideas and leading group processes.

After investigating the principles, strategies and tools of “Virtual Team Work”, “Computer-Mediated Communication”, "Intercultural" and "Cross-cultural Management", critical incidents, case studies and remote collaboration on tasks and a major project will enable the students to tackle and resolve real-life issues and to gain hands-on experience in this field.

Key competencies put into practice and developed include: intercultural skills, dealing with diversity, media competence, problem solving, decision making, solving con-

flicts, group and self-management, interpersonal and team-working skills, oral communication skills, self-reflection.

Content:

Unit	Content	Didactics	Time-line	Contact hours h	Student led work h	Evidence of achievement
M6.1 Computer-Mediated Communication (CMC)	▪ theories of computer-mediated communication (cmc): media richness, hyperpersonal communication, social information processing online etc. ▪ research methods in cmc ▪ empirical results concerning cmc and remote team work ▪ strategies for remote online collaboration: managing projects, moderating teams, delivering presentations, facilitating decision processes, generating ideas and leading group processes	Blended Learning (face-to-face and synchronous and asynchronous online communication) ▪ online group assignments ▪ computer-mediated presentations ▪ individual work ▪ intensive self-tuition ▪ research ▪ exercise ▪ individual student papers	Week 1 to 15	22,5	52,5	3 ECTS LK 90
M5.2 Remote Collaboration in Virtual Teams	▪ distributed software projects ▪ international approaches to software development ▪ knowledge sharing in distributed teams ▪ cross-cultural collaboration and management ▪ managing in a virtual environment ▪ forms of virtual organizations and groups ▪ performance management in virtual teams ▪ dealing with conflict in remote team work ▪ project management in distributed teams (project definition varies from semester to semester)	Online-class using synchronous and asynchronous online communication ▪ online project work ▪ online presentation ▪ interactive online lectures ▪ online coaching	Week 1 to 15	22,5	52,5	3 ECTS LA
M5.3 Intercultural Management	▪ Introduction: the significance and complexity of culture and culture-related issues in an international business environment, ▪ the roots of Intercultural and Cross-cultural Management, its history and interdisciplinary facets ▪ the current developments and methodological approaches strategies of Intercultural Management ▪ the perception and assessment of cultural phenomena ▪ a critical evaluation of the most widely traded "culture	Face-to-face class ▪ interactive lectures ▪ group assignments ▪ individual student papers ▪ intensive self-tuition	Week 1 to 15	45	55	4 ECTS LK 120

	models" ▪ the discourse and the semiotics of Intercultural and Crosscultural Management training					

Usability of the module:

Unit M6.1:
Can be integrated in other courses.

Unit M6.2:
This unit is delivered online in collaboration with other universities. Integration in courses at Universities in other countries is highly desirable, since it would distribute the remote team work to even more locations. Integration in courses onsite in Heilbronn is not desirable, since it would not distribute the collaboration any further. The number of students is high, since this unit is mandatory for "Software Engineering and Management" in Heilbronn, Germany, and optional for informatics-students in Brasov, Romania. But since it is delivered online there is a higher tolerance for a large number of students.

Unit M6.3:
Delivered by the faculty "Wirtschaft 2" in Heilbronn – this unit is mandatory for two master's courses ("Software Engineering and Management" and "International Business/International Management"), thus the number of students might be too high if integrated in other courses.

Allocation of ECTS credits:

This module forms a mandatory part of the M.Sc. course "Software Engineering and Management" yielding 10 ECTS-credits in total. Credits are allocated per unit: Unit M6.1 and M6.2 yielding 3 credits each, M.3 yielding 4 credits. The ECTS credits allocated to this module will not be awarded unless the participants have achieved a pass mark in each unit.

Literature/Sources:

Current literature will be used and be published at the beginning of the units. Sources for the projects will either be delivered by the lecturers or researched by the students.

- Casey, Valentine & Richardson, Ita (2006). Uncovering the reality within virtual software teams. In: Proceedings of the 2006 international Workshop on Global Software Development For the Practitioner (Shanghai, China, May 23 - 23, 2006). GSD '06. ACM Press, New York, NY, p. 66-72.
- Cornelius, C., & Boos, M. (2003). Enhancing mutual understanding in synchronous computer-mediated communication by training: Trade-offs in judgmental tasks. Communication Research, 30 (2), 147-177.
- Duarte, D. L. & Tennant Snyder, N. (2001), Mastering Virtual Teams - Strategies, Tools, and Techniques That Succeed, John Wiley & Sons
- Hinds, P. & Kiesler, S. (2002): Distributed Work. Cambridge, MA: MIT Press.
- Jacob, N. (2003): Intercultural Management, London.

- Jammal, E. (2003): Kulturelle Befangenheit und Anpassung. Deutsche Auslandsentsandte in arabisch-islamischen Ländern, Wiesbaden.
- Karolak, D. W. (1998), Global Software Development - Managing Virtual Teams and Environments. Los Alamitos: IEEE Computer Society Press.
- Marsden, N. & Götz, K. (2000): Der soziale Kontext im Computernetzwerk, in: Grundlagen der Weiterbildung, 5, 225-228.
- Mead, R. (1998): International Management: Cross-Cultural Dimensions, New York.
- Redding, G., Stening B. W. (2003): Cross-Cultural Management, Cheltenham.
- Thomas, D.C. (2003): Readings and Cases in International Management: A Cross-Cultural Perspective, London 2003.
- Thurlow, C. et al. (2004): Computer Mediated Communication - Social Interaction and the Internet. London: Sage.
- Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. Communication Research, 23 (1), 3-43.
- Walther, J. B., & Parks, M. R. (2002): Cues filtered out, cues filtered in: Computer-mediated communication and relationships. In M. L. Knapp & J. A. Daly (Eds.), Handbook of Interpersonal Communication (3rd ed., pp. 529-563). Thousand Oaks, CA: Sage.

Module M7 – Master's Thesis

Responsible for this module:

All the professors in the Software Engineering program.

Prerequisites:

none

Basic data:

Status	Se-mes ter	Dura-tion	Prov ided	Pre-requisite Modules	hrs/wk	Contact Hours	Student-led-Work	Credits
Manda-tory	3	1 Sem.	every year					30

Module Objectives:

The module consists of two parts:

1) The Master's Colloquium
2) The Master's Thesis

The Master's Colloquium is a seminar, which serves two purposes: (1) The students learn methods, practices and principles required to deliver high-quality scientific work, especially how to do literature research, cite, quote and reference correctly und and how to organize the thesis work. (2) The colloquium provides an opportunity to present and discuss ongoing and finished master's theses. Each student has to give an effective and coherent report on content, approach, and findings of his or her master's thesis (as far as the status of the thesis is concerned), prepare an adequate hand-out, and motivate and facilitate a discussion on the thesis. As a presenter as well as a member of the audience, the students have to show their conceptual and academic skills, make appropriate inferences and recommendations, show the ability to reason in a consistent methodological manner, and deal with criticism and close scrutiny constructively.

During their Master's Thesis the students focus on a specific topic. The subject can either be defined by a professor at the university or by a professor in close cooperation with a company which is well established in the respective field. In both cases the students can and should be involved in the definition of the topic. During the thesis the students are supervised by a professor. However, in general they must demonstrate that they are able to do independent research work. The result of the Master's Thesis is a written document which meets all standards of a scientific publication.

Content:

Unit	Content	Didactics	Time-line	Con-tact hours h	Stu-dent led work h	Evidence of achieve-ment
M7.1 Master's Colloquium	▪ Methods, practices and principles of scientific research and work ▪ Practical advise on "How to write a master's thesis?" ▪ Presentation of ongoing or finished master's theses ▪ Critical reflections on delivered artefacts of scientific work	▪ Lectures ▪ Presentations ▪ Discussions ▪ Exercises ▪ Self-Study	Week 1 to 15	22,5	77,5	4 ECTS LA
M7.2 Master's Thesis	▪ Definition of a specific topic (done by the professor together with the student and optionally a company) ▪ Definition of a project plan for the thesis work ▪ Literature research for the topic (resulting in the state of the art) ▪ Finding and implementing a solution for the outlined problem ▪ Documentation of the o Outlined problem o The relevance of the problem o The state of the art o The proposed solution o The feasibility, applicability and benefits of the solution o The conclusion	▪ The student performs the work guided by a professor and/or a company				26 ECTS PT

Usability of the module:

Mandatory module in the third semester of the master's program.

Allocation of ECTS credits:

This module forms a mandatory part of the M.Sc. course "Software Engineering and Management" yielding 30 ECTS-credits in total. Credits are allocated per unit: Unit M7.1 yields 4 credits and unit M7.2 yields 26 credits. The ECTS credits allocated to this module will not be awarded unless the participants have achieved a pass mark in each unit.

Literature/Sources:

Current literature and online resources which are investigated by the students. Starting points are provided by the advising professor.