Imprint
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INDEX

ABOUT MASTER’S DEGREE PROGRAM 3
  About International Education 3
  About Visual Computing 3
  Goal of Master’s Degree Program in Visual Computing 3
  Course Content 4
  Structure of Studies 4

MODULE DESCRIPTION 5
  Basics of Computer Graphics 5
  Multimedia and Interaction 9
  Theoretical Basics and In-Depth Computer Science 13
  German Language Training 24

EXAMINATIONS 25

HOW DOES IT WORK? 26

APPLICATION PROCEDURE: WHO CAN JOIN? 27
  Entry Requirements 27
  Admission Procedure 27
  Charges and Scholarships 27
  From Application to Diplomas 27

CONTACT INFORMATION 28

ABOUT THE INFORMATION TECHNOLOGIES EDUCATION AND RESEARCH CENTRE 29

ABOUT THE UNIVERSITY OF ROSTOCK 30
  Research 30
  Faculties 30

ABOUT THE FACULTY OF COMPUTER SCIENCE AND ELECTRICAL ENGINEERING 31

ABOUT THE CITY OF ROSTOCK 32

ADDITIONAL FEES 33
  Costs of living in Rostock 33

DAAD - SUPPORT OPPORTUNITIES 34
ABOUT THE MASTER’S DEGREE PROGRAM

About International Education (www.ie-rostock.de)

The International Education Program of the University of Rostock and the Yerevan State University (YSU) offers several programs for foreign students interested in abroad studies and research exchanges at Germany.

Beginning with October 2010, the University of Rostock and the Yerevan State University offer a variety of M.Sc. programs of the University of Rostock to YSU students. The first offered programs will be Computer Science/Visual Computing and Computational Sciences and Engineering. Additional programs will be offered in October 2011 and 2012.

About Visual Computing

Visual Computing covers the data processing aspects of image acquisition, analysis and synthesis. Images are used to visualize complex geometric and abstract data in different domains of natural, technical and medical sciences as well as in bioinformatics and media and entertainment industry. Images serve as visual interfaces for information and simulation systems and systems for an interactive data analysis; user interface design is among many different areas, in which visual computing techniques are utilized.

Goal of the Master’s Degree Program in Visual Computing

The goal of the program is to build an advanced knowledge in the field of computer science in general, and in the field of visual computing, in particular. The Visual Computing Master’s program provides students with the tools and methods, which will enable them to deal with complex issues in computer graphics, teaches to identify and address current and emerging questions and challenges in the field, prepares students to make scientific contribution to computer science and, especially, to visual computing. The program puts substantial emphasis on students’ individual scientific work, which will better prepare them for further scientific and research work in the industry or in research institutions.
Course Content

The modules/courses of Visual Computing are categorized into the following 4 categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>ECTS Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basics of Computer Graphics</strong></td>
<td>27</td>
</tr>
<tr>
<td><strong>Multimedia and Interaction</strong></td>
<td>18</td>
</tr>
<tr>
<td>Advanced Communications, Graphical User Interface, Hard- and Software System for Interactive Virtual Environments, Human Computer Interaction, Multimedia Databases, Multimedia Communications, Ubiquitous Computing and Smart Environments</td>
<td></td>
</tr>
<tr>
<td><strong>Theoretical Basics and In-Depth Computer Science</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>Literature or software project</strong></td>
<td>12</td>
</tr>
<tr>
<td><strong>German language training</strong></td>
<td>18</td>
</tr>
<tr>
<td>German Language for Beginners</td>
<td></td>
</tr>
</tbody>
</table>

Structure of Studies

- The regular period of studies, including Master’s thesis preparation and defence, is four terms.
- The program is split in modules (Basics of Computer Graphics, Multimedia and Interaction, Theoretical Basics and In-Depth Computer Science) and takes three terms. There is also a literature/software project and German language training (which is required for all students lacking German language skills) as part of the study.
- Master’s thesis is written and defended during the fourth semester at the University of Rostock (Germany.)

The following module description gives an overview about the offered courses:

- Courses for Winter Semester 2010/11 and Summer Semester 2011
- Curricula for further semesters will be published later
- Further details of the hole curricula are given under: [www.ie-rostock.de](http://www.ie-rostock.de)
MODULE DESCRIPTION:¹

BASICS OF COMPUTER GRAPHICS (27 ECTS² credit points)

Visual Computing

Module Number: IEF 403
Lecturer: Prof. Dr. Oliver Staadt
Module Composition: 3 SWS¹ Lecture including Tutorial
ECTS Credit Points: 6
Content: This module deals with the basics of Visual Computing

- Introduction
- Perception and colour models
- Camera models
- Projection
- Image filtering and -segmentation
- Image analysis
- Graphic pipeline
- Three-dimensional reconstruction
- Computational Photography

The students will become proficient in the methods and algorithms of the Image analysis and synthesis and should be able to solve problems.

Recommended literature:


Realtime Computer Graphics

Module Number: IEF 403
Lecturer: Prof. Dr. Oliver Staadt
Module Composition: 3 SWS (Lecture including Tutorial)
ECTS Credit Points: 6
Content: This module deals with advanced topics in realtime computer graphics and is structured as follows:

- Introduction
- The Rendering Pipeline
- Spatial data structures

¹ Information about the courses offered is subject to change, for the latest info please inquire locally at IT ERC or follow the link for the latest updates http://www.ie-rostock.de/.
² ECTS: European Credit Transfer System
³ SWS: Hours of lecture per week during one semester (1 SWS = 45 minutes)
Students will develop a deep understanding for advanced topics in real-time Computer Graphics. They will become familiar with data structures, algorithms and architectures used in interactive graphics systems such as game engines. In a practical programming project students will design and implement a real-time graphics engine and they will learn how to present their work in an oral presentation and a written report.

**Recommended literature:**


**Comment:**

The tutorial part of this lecture will be done in the block seminar in Yerevan.

**Geometric Modelling**

**Module Number:** IEF 402  
**Lecturer:** Prof. Dr. Heidrun Schumann  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3

**Content:** This module deals with the following advanced topics in modelling geometrical objects:

- Introduction of fundamental mathematic terms  
- Modelling  
- Representation of objects  
- Decomposition models  
- Construction models  
- Border models  
- Basic experimentations in modelling systems  
- Representation of curve and areas  
- A short overview into NURBS  
- Modelling in Computer Graphics  
- Modelling kernel ACIS

**Recommended literature:**

Current Topics in Computer Graphics

**Module Number:** IEF 401  
**Lecturer:** Prof. Dr. Oliver Staadt  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3

**Content:** This module deals with current topics in computer graphics with varying content. The content will be determined at the beginning of the course depending on the chosen focus.

Students will develop a deep understanding for current challenges in computer graphics. They will become familiar with the latest trends in computer graphics. Based on this understanding, they will be able to develop new application areas for computer graphics and to identify open problems.

**Recommended Literature:**

Will be given at the beginning of the course based on the selected topics.

Rendering

**Module Number:** IEF 076  
**Lecturer:** Prof. Dr. Heidrun Schumann  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3

**Content:** This module deals with the basics for the realistic image representation:

- Introduction
- Visibility calculation (VisibSichtbarkeitsberechnungen)
- Rendering - Basics
- Global lighting calculation (Globale Beleuchtungsberechnungen)
- Advanced condepts (Image-based Rendering, Non-Photorealistic Rendering).

The students will be enabled to to employ visibility and lighting calculations and also to design them for rendering three-dimensional scenes.

**Recommended literature:**


Graph Visualization

**Lecturer:** Dr. Hans-Jörg Schulz  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3

**Content:** Graphs have become commonplace in main stream culture and are no longer understood by engineers and scientists only. For instance, social networks, 50 years ago just known to a few sociologists, are nowadays an integral part of most peoples’ online lives. With the rising awareness of graphs, their spread to numerous other fields, and their ever growing size, the need for computational aids in comprehending them and reasoning with them arose. One of the most common techniques to do so is the use of information visualization for an interactive, graphical depiction of graphs.

This special lecture is targeted towards graduate students from all fields, who are interested in a fast-
track introduction to graph visualization from the basics all the way to the bleeding edge of current research in this field. Knowledge of some graph theory, graph algorithms, or information visualization is desirable but not required.

**Computer Animation**

**Module Number:** IEF 058  
**Lecturer:** Prof. Dr. Heidrun Schumann  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3  
**Content:** This module deals with the basics of Computer Animation:

- Introduction  
- History of the animation  
- Keyframe-Animation  
- Global transformations  
- Direct und inverse kinematics  
- Deformation  
- Warping and Morphing  
- Motion Capturing and Motion Editing  
- Physical-based modelling and animation

The students will be able to know the advantages and disadvantages of the single methods and to find solutions for problems.

**Recommended literature:**


**Information Visualization**

**Module Number:** IEF 127  
**Lecturer:** Prof. Dr. Heidrun Schumann  
**Module Composition:** 2 SWS Lecture + 1SWS Tutorial  
**ECTS Credit Points:** 3  
**Content:** This module deals with basics of visual analyses and graphical representation of complex information:

- Object of visualization- the data  
- Influencing factors on visualization- aims and context  
- Basic methods for the imaging of data  
- Visualization methods  
- Visualization of multivariate data.  
- Visualization of structures  
- Visualization of elements of complex information pools  
- Visual interfaces  
- Visual Analytics  
- Visualization systems

The students will be enabled to illustrate complex information graphically.

**Recommended literature:**
MULTIMEDIA AND INTERACTION (18 ECTS credit points)

Hard- and Software-Systems for Interactive Virtual Environments

Module Number: IEF 407  
Lecturer: Prof. Dr. Oliver Staadt  
Module Composition: 2 SWS Lecture including Tutorial  
ECTS Credit Points: 3

Content: This module deals with hardware and software systems for interactive virtual environments.

- Introduction  
- History of Virtual Reality  
- Foundations  
- Human factors  
- Input devices  
- Output devices  
- Display technology  
- 3D displays  
- 3D Interaction  
- Teleimmersion  
- Virtual sets  
- Applications

Students will develop a deep understanding for hardware and software system aspects of virtual environments and interactive computer graphics for advanced topics in real-time Computer Graphics. They will become familiar with current device technology as well as software design and application requirements for virtual environments. Furthermore they will learn how to present topics in virtual environments in oral presentations and written reports.

Recommended Literature:


Human Computer Interaction

Module Number: IEF 033  
Lecturer: Dr. Anke Dittmar  
Module Composition: 2 SWS Lecture  
ECTS Credit Points: 3

Content: Human-Computer Interaction (HCI) is an interdisciplinary branch dealing with the topics Design, Assessment and implementation of interactive Software-Systems to make them more applicable for the people. The participants will learn the basics of the Human-Computer Interaction. This will be made possible by the approach, models and theories for the description of human behaviour pattern, engineering systems and the interaction between them.
Basics: human-being, computer, interaction
- Design of interactive systems: basic designs and rules, interaction paradigms, support of implementation
- Basic approaches of the design processes: User-Centered Design, Scenario-Based Design, Model-Based Design, Rational Design, ethnographic approach
- Mean for the description of the various aspects in HCI:
  - Cognitive models
  - Aufgabenmodelle
  - System and Dialog models
  - Communication- and Collaboration-Models
- Evaluation techniques
- Reflection of case studies

Recommended Literature:

Multimedia Databases

Module Number: IEF 116
Lecturer: Dr. Holger Meyer
Module Composition: 2 SWS Lecture
ECTS Credit Points: 3

Content: The management and search of multimedia databases are a challenge for database systems. Various architectures for the support of multimedia data are mainly presented in object relational databases. The special challenges, techniques of the content-based search, storage processes and indexing techniques are presented for the single media types (Audio, 2D/3D, Video Still-Image, …). Practical exercises on the board and the computer demonstrate exemplary the possibilities and limitations of current systems.

- Basis of relational and object-based databases
- Basic implementation techniques Client/Server-Architectures and distributed databases
- Multimedia-Application and types of data
- Concept of databases for the Multimedia-Applications
- Inquiry and index structures for Multimedia-Data
- Data structures for Multimedia-Data
- Concepts of transaction for Multimedia-Data
- Distributed Media-Server

Recommended Literature:
Advanced Communications

Module Number: IEF 058  
Lecturer: Dr. Thomas Mundt  
Module Composition: 3 SWS Lecture + 1 SWS Tutorial  
ECTS Credit Points: 6  
Content: This module deals with new communication methods, protocols and approaches for an advanced studies in information and communication services:

- Advanced communication models (like Peer to Peer, spontaneous networking, Meshing, Roaming, Ad Hoc networks)  
- Modalities in communication services  
- Mobile communication  
- Methods for the specification of protocols  
- Representing recent application protocols

The students get knowledge of current technical methods, protocols, applications in the area of communication and will be able to work with standards, norms and original documentations.

Graphical User Interfaces

Module Number: IEF 110  
Lecturer: Dr. Bernd Karstens  
Module Composition: 2 SWS Lecture  
ECTS Credit Points: 3  
Content: This module deals with technological and ergonomic factors for the development, design and programming of graphical user interfaces:

- Introduction into the graphical user interfaces  
- Dialog and interaction methods  
- Models for the description of graphical user interfaces  
- Aspects of the visual perception  
- Norms und style guides for the graphical user interfaces  
- Tools for the design of graphical user interfaces

Students will be enabled to design and program graphical user interfaces.

Recommended literature:

- Shneiderman, Ben.: User Interface Design. Bonn, 2002  
- Dahm, Markus: Grundlagen der Mensch-Computer-Interaktion, Pearson 2006

Multimedia Communication Systems

Module Number: IEF 043  
Lecturer: Prof. Dr. Bodo Urban  
Module Composition: 2 SWS Lecture  
ECTS Credit Points: 3
Content: This module gives an overview of the basic technologies for multimedia-applications:

- Digitisation, coding, compression
- Method for the audio coding and compression
- Method for image and video compression
- Systems for the production of multimedia presentations

Students will be taught the basic concepts of coding and compression of multimedia data types.

Recommended literature:


Ubiquitous Computing and Smart Environments

Module Number: IEF 124
Lecturer: Prof. Dr. Thomas Kirste
Module Composition: 3 SWS Lecture + 1 SWS Tutorial
ECTS Credit Points: 6
Content: This course gives an introduction into the most significant paradigms and solutions of Ubiquitous Computing:

- Basic paradigms: Information Appliances, Ubiquitous Computing, Ambient Intelligence
- Usability-challenges and first solutions: Affordances, UbiComp at Cerox PARC, Reactive Environments, Smart Ensembles
- Interaction paradigms for infrastructures
- Sensor technology for the recognition of situations
- Theoretical probability methods of the situation analyses
- Context management: context models, context acquisition, context storage and context diffusion context spreading in distributed infrastructures
- Basic techniques of the Service- and Device-Discovery: Jini, OSGi, UPnP
- Illustration of various principles and methods by means of current projects and applications in the area Ubiquitous Computing and Smart Environments

Learning aim is the understanding of basic problems of the ubiquitous assistance and the connections between the branches of the area.

Recommended literature:

- Cook D, Das S. Smart Environments. Wiley, 2005
- Journal Personal and Ubiquitous Computing (Springer)
- Journal IEEE Pervasive Computing
- Conference Proceedings of Pervasive
- Conference Proceedings of UbiComp
THEORETICAL BASICS AND IN-DEPTH COMPUTER SCIENCE (21 ECTS credit points)

Mobile Computing

Module Number: IEF 13
Lecturer: Dr. Robil Daher
Module Composition: 2 SWS Lecture + 1 SWS Tutorial
ECTS Credit Points: 3
Content: Mobility and communication require the development of new and improved algorithms and technologies. The ubiquitous access to the internet requires global solutions, providing the interoperability between the various available and future technologies. The lecture “Mobile Computing” presents the basics of the development of such systems.

- Introduction into the basics of Mobile Communication
- Application examples of Mobile Communication
- Mobile Communication in detail:
  - Basics of the signal theory
  - Communication Technologies
  - Infrared Communication
  - TETRA and DECT
  - GSM, HSCSD, GPRS, EDGE and UMTS
  - Satellite Communication like IMARSAT, GPS, GLONASS, Galileo
  - WLAN, Bluetooth and WiMAX
  - Devices
  - Routing in mobile networks
  - Hybrid Communication
  - Methods for the Authentication, Authorization and the Accounting (AAA)
  - Secure wireless transfer as well as the Quality of Service (QoS)

After the successful completion of the module, the students are able to describe the construction and functioning of mobile systems. They have the capability to plan and realise mobile installations and have the knowledge in the fields of Communication and the efficient management of wireless networks.

Recommended Literature:


Multi Agent Systems

Module Number: IEF 115
Lecturer: Prof. Dr. Adelinde Uhrmacher
Module Composition: 2 SWS Lecture
ECTS Credit Points: 3
Content: The lecture gives an overview of the methods of Multi-Agent System Science and deals with deliberative and mobile agents. Moreover the lecture demonstrates the System Architectures and the development and evaluation of Multi-Agent Systems. It covers the following topics:

- Agents: Autonomy between reactive and deliberative
- Architectures: BDL, subsumption and other
- How rational are agents: Logical attempts
- Communication between agents: Speech-Acts, KIF, KQML, FIPA-ACL
- Representation of common knowledge: Ontologies, Semantic Web, DAML-OIL, etc.
- Co-operation without Communication?: Decision theory and implications
- Distributed solving of problems, planning and optimization
- Learning in Multi-Agent Systems
- Mobile agents
- Agent-Platforms
- Application fields
- Simulation and Multi-Agent Systems

Recommended Literature:


Scalable Computing

Module Number: IEF 077
Lecturer: Prof. Dr. Peter Luksch
Module Composition: 2 SWS Lecture + 1 SWS Tutorial + 1 SWS Lab Work
ECTS Credit Points: 6

Content: Scalable Computing deals with clusters and computational grids. This course gives an overview of cluster computing, covering both hardware and software topics. Furthermore it provides an introduction to Grid Computing, which is a rapidly developing field. We will consider the tasks Grid middleware in some detail to enable the controlled sharing of resources in virtual organizations. A selection of Grid middleware projects that are about to establish as de facto standards will be presented in detail. The lecture is complemented by a practical laboratory course in which students develop and analyze applications on clusters and grids, using debugging and performance analysis tools.

Here an overview about the lecture content:

- High Performance Computer Architectures: Classification and Historical Perspective
- Clusters
  - Definition of a cluster, why clusters?
  - Distinction from parallel and distributed systems
  - Types of clusters: High performance clusters, high throughput clusters, high availability clusters
  - Single System Image
  - Resource Management and Scheduling
  - Programming Paradigms and Programming Environments
  - The OpenMP Standard (Shared Memory Programming)
  - The Message Pasing Interface MPI
  - Leightweight Message Passing Systems
  - High Performance Networking
  - Tools for Parallel Program Development and Analysis
  - Cluster System Software

- Computational Grids
  - Historical perspective, evolution of visions, concepts and software
  - Grid Architecture and Technologies
  - Grid Middleware: Tasks and Solutions
  - Anatomy and Physiology of the Grid
  - The Globus Project
  - The Open Grid Services Architecture (OGSA)
An object-oriented Approach to Grid Computing: The Legion Project and the Avaki Software
- The UNICORE project
- Industrial Grid Initiatives
- Grid Programming Environments
- Grid Portals
- Parameter Sweeps on the Grid
- Grid Applications
- E-Science
- Data intensive Grids for high-energy physics
  - Current Hot Topics
  - Future Challenges

Having completed this course, students will be able to design and implement programs for execution on clusters and in grid environments, using state-of-the-art methods and software tools for software development and performance analysis. They will acquire a sound understanding of cluster and grid architectures that will enable them to understand performance analysis results and optimize their programs accordingly.

Methods for Machine Learning

**Module Number:** 23258  
**Lecturer:** Prof. Dr. Lars Schwabe  
**Module Composition:** 2 SWS Lecture + 1 SWS Tutorial  
**ECTS Credit Points:** 3

**Content:** This course introduces methods for machine learning, where we adopt a probabilistic perspective. Participants of this course have a keen interest in the field of machine learning, which is needed in, for example, artificial intelligence, data mining, human computer interaction, computer vision, or visual computing in general. This course is organized as an introductory course with minimal requirements. After having taken the course, the participants will be able to continue with self-study or with more specialized courses.

The lecture covers the following topics:

- Basics (hypothesis testing, probability theory, information theory)
- Preprocessing (PCA, SVD, Clustering, Filters, ICA)
- Approximation and optimization techniques
- Message passing and EM algorithm(s)

**Recommended Literature:**

- Pattern Recognition and Machine Learning, C. M. Bishop, Springer, 2006

Cognitive Systems

**Lecturer:** Prof. Dr. Alke Martens  
**Module Composition:** 2 SWS Lecture + 1 SWS Tutorial  
**ECTS Credit Points:** 3

**Content:** Cognitive systems are based on research in computer science, psychology (mainly cognitive psychology), medicine and other disciplines. This course is an introduction to the broad field of cognitive systems and of human cognition. Topics are:

- Historical background
- Definition of terms
Cognitive psychology, ideas about investigating human cognition
Artificial intelligence
Cognitive architectures (e.g. ACT-R, SOAR)

After the successful completion of the module, the students know the difference of research in cognitive psychology and research cognitive science. They are able to relate insights in human cognition to aspects of artificial intelligence. They have understood how cognitive architectures are constructed and how the field relates to computer science.

Recommended Literature::


Advanced Database Systems

Lecturer: Prof. Dr. Ashot Vasilyan
Module Composition: 2 SWS Lecture
ECTS Credit Points: 3

Content: This course covers advanced database management system design principles and techniques. Possible topics include access methods, query processing and optimization, transaction processing, distributed databases.

- Overview of database systems transaction processing, distributed systems, and tuning.
- Indexing and Hashing. Physical design of centralized databases.
- Query Processing.
- Query Optimization.
- Transaction Conception, ACID, Serializability, Recoverability.
- Serialization Theory
- Two Phase Locking.
- Non-locking schedulers.
- Centralized recovery.
- Distributed recovery. Two Phase Commit Protocol.
- Replicated Data.

Recommended Literature:


Comment: This lecture will be hold locally at YSU.
Cryptography and Internet Security

**Lecturer:** Prof. Dr. Gurgen Khachatrian  
**Module Composition:** 4 SWS Lecture  
**ECTS Credit Points:** 6  
**Content:** The students should learn about basic principles and methods of modern applied cryptography. They should understand how cryptography can help to solve information security related problems and our focus will be basically internet security. Furthermore, they should be able to implement in software basic cryptographic primitives.

The following topics are covered:

- Overview of cryptography and internet security problems  
- Mathematical background: Introduction to finite fields and Number Theory  
- Design principles for modern symmetric ciphers, modes of operation  
- Randomness and Pseudo-Randomness  
- Key management dilemma: Different approaches  
- Public-key Cryptography: Diffie-Hellman, RSA, ElGamal, Elliptic Curve based systems  
- Message Authentication codes (MAC), Hash Functions, Digital signatures and Digital Certificates (X.509)  
- Network Layers: from Links to Endpoints  
- E-mail Security :Pretty Good Privacy (PGP)  
- Internet security Protocol (IpSec)  
- Secure Socket layer (SSL)/Transport Layer Security (TLS). Secure Electronic Transactions

**Comment:** This lecture will be hold locally at YSU.

Bio-inspired Artificial Intelligence

**Lecturer:** Prof. Dr. Lars Schwabe  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3  
**Content:** We take a grass-root approach to artificial intelligence. We consider models of “intelligent” natural systems and work out how to exploit the information processing strategies exhibited by, for example, the nervous system in order to build smarter computing systems.

- The Hodgkin-Huxley Model  
- Simplified Neuron Models  
- Synaptic Transmission and Plasticity  
- Firing-Rate Models  
- The Hopfield Net and the Boltzmann Machine  
- Sensory Coding  
- Reinforcement Learning  
- Primer on Game Theory  
- Particle Swarm and Evolutionary Optimization  
- Immunological Computation

**Recommended Literature:**

Distributed Algorithms

**Lecturer:** Prof. Dr. Gero Mühl  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3  
**Content:** Today’s application systems are usually not limited to one individual computer, but rather run on several computers which are connected via a network without sharing physical memory. Algorithms for such "Distributed Systems" are more complex than comparable centralized algorithms. This lecture gives an overview about conceptual problems of distributed systems and covers algorithmic solutions for these problems.

- Organizational matters  
- Models for Distributed Systems  
- Flooding, Broadcast, Echo  
- Election  
- Termination  
- Mutual Exclusion  
- Validation  
- Logical Clocks, vector clocks, clock synchronization  
- Snap shots  
- Fault tolerance  
- Replication  
- Transactions  
- Security

**Recommended Literature:**


Database Systems Principles

**Lecturer:** Prof. Manuk Manukyan  
**Module Composition:** 4 SWS Lecture  
**ECTS Credit Points:** 6  
**Content:** The course assumes basic knowledge of the functional aspects of databases and an undergraduate-level familiarity with data structures and algorithms.

- Data Storage  
- Representing Data Elements  
- Efficient data manipulation using indexing and hashing  
- Query processing  
- Crash recovery  
- Concurrency control  
- Information Integration
- Distributed databases

**Recommended Literature:**


**Comment:** This lecture will be hold locally at YSU.

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**Methodology of Object-Oriented Design**

**Lecturer:** Prof. Armen Kostanyan  
**Module Composition:** 4 SWS Lecture  
**ECTS Credit Points:** 6

**Content:** The Unified Process (UP) of software development and its characteristics: use-case drivability, architectural orientability, iterative- and incrementability. The UP artifacts; using the Unified Modeling Language (UML) to represent results of analysis and design. Constructing solutions for main design problems, such as interaction with external services, use of pluggable strategies, switch to local services, work with a persistence storage, etc.

- Software Development Process  
- Use-Case Model  
- Domain Model  
- Design Model  
- Implementation Model  
- Designing interactions with external services  
- Using the varying strategies  
- The Model-View Separation principle and designing windows refresh  
- Usage of a local service to increase effectiveness of work with an external service  
- Support for persistent objects

**Recommended Literature:**

- Design Patterns: Elements of Reusable Object-Oriented Software, by E. Gamma, R. Helm, R. Johnson, J. Vlissides, Addison-Wesley, 1995

**Comment:** This lecture will be hold locally at YSU.

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**XML Databases**

**Lecturer:** Prof. Manuk Manukyan  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3

**Content:**  
- XML Data Model  
  XML data concept, DTD as a language for defining the database schema, DTD operators.
- **XML Schema**
  XML schema as an XML application, type system, element and attribute declarations, identity-constraint and notation definitions, high level language tools to define XML data.

- **XML Query Algebra**
  Operations, operators, grouping, ordering, sorting, aggregation, structural recursion, algebra components, static semantics (type inference rules), dynamic semantics (value inference rules).

- **XPath**
  Path expressions, standard functions.

- **XQuery**
  Path expressions, element constructors, FLWR expressions, operators in expressions, conditional expressions, quantified expressions, list constructors, operations on datatypes.

**Recommended Literature:**


**Comment:** This lecture will be hold locally at YSU.

**Fundamental Algorithms**

**Lecturer:** Prof. Armen Kostanyan

**Module Composition:** 4 SWS Lecture

**ECTS Credit Points:** 6


- Recurrences solving strategies
- Divide and Conquer Algorithms
- Sorting Algorithms
• Hashing
• Dynamic Programming
• Greedy Algorithms
• Graph Algorithms
• NP-Completeness

Recommended Literature:


Comment: This lecture will be held locally at YSU.

Development of Web Based Systems

Lecturer: Prof. Arthur Avagyan

Module Composition: 2 SWS Tutorial and Lab work

ECTS Credit Points: 3

Content: The advent of the World Wide Web and the new technologies and standards surrounding it has dramatically changed the way systems are developed and used in organizations. This course covers the issues and concepts in developing data driven web sites. Students will evaluate a variety of different web development approaches and architectures, including the common gateway interface model, Java. A variety of alternative development approaches are compared, looking at issues such as the development environment, and the security, performance, scalability, and maintainability of systems developed with the different approaches. The class will be divided into student teams. Each team will implement a small system using one of the supported technologies and evaluate their experience. Students should have the ability to build a simple data driven web sites. There will be light programming used as examples of how to build dynamic web pages. Assignments will include J2EE. During the teaching this course would probably used examples on Linux and MySQL and less on Windows and .NET. The idea of this course is to expose the students to different development approaches for developing dynamic web sites (i.e. web sites whose content is based on a database that is changing). The approaches are Java (i.e. J2EE and all the tools for servlets, JSP, etc), and the Open Source LAMP approach (Linux, MySQL and etc.).

Web-Based Systems course concentration is designed for students who are interested in using the web to interface to customers and suppliers. The web has become the standard method of delivering content to both internal and external users, as well as the basis for new XML based standards for interfacing between business processes.

• WEB Development Basics
• Web Applications
• Markup and Scripting Languages
• WEB page design and development

Recommended Literature:

Design Advanced Web Based Systems

**Lecturer:** Prof. Arthur Avagyan  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3  
**Content:** The advent of the World Wide Web and the new technologies and standards surrounding it has dramatically changed the way systems are developed and used in organizations. This course covers the issues and concepts in developing data driven web sites. Students will evaluate a variety of different web development approaches and architectures, including the common gateway interface model, Java. A variety of alternative development approaches are compared, looking at issues such as the development environment, and the security, performance, scalability, and maintainability of systems developed with the different approaches. The class will be divided into student teams. Each team will implement a small system using one of the supported technologies and evaluate their experience. Students should have the ability to build a simple data driven web sites. There will be light programming used as examples of how to build dynamic web pages. Assignments will include J2EE. During the teaching this course would probably used examples on Linux and MySQL and less on Windows and .NET. The idea of this course is to expose the students to different development approaches for developing dynamic web sites (i.e. web sites whose content is based on a database that is changing). The approaches are Java (i.e. J2EE and all the tools for servlets, JSP, etc), and the Open Source LAMP approach (Linux, MySQL and etc.).

- Advanced means of website design  
- Building Web Applications  
- Server Side models and Security  
- Unix as Web platform, and Unix/Linux Application development approaches  
- The Windows Platform and development tools.  
- Specialized Servers for Multimedia. Audio/Video Servers  
- Network bandwidth problems and solutions. Bandwidth limitations  
- Tools for building data driven web sites. Scalability and reliability

**Recommended Literature:**

- Nicholas C. Zakas, High Performance JavaScript (Build Faster Web Application Interfaces), March 2010  
- David Parsons, Dynamic Web Application Development using XML and Java, August 2008

**Comment:** This lecture will be hold locally at YSU.
Module Composition: 2 SWS Lecture  
ECTS Credit Points: 3  
Content: This course is intended for students who want an in-depth look at how business firms use information technologies and systems to achieve corporate objectives. Information technologies are one of the major tools available to business managers for achieving operational excellence, developing new products and services, improving decision making, and achieving competitive advantage. The course provides an overview of fundamental MIS concepts using an integrated framework for describing and analyzing information systems. This framework shows information systems composed of management, organization, and technology elements.

- Organizations, Management, and the Networked Enterprise
- Information Technology Infrastructure
- Key System Applications for the Digital Age
- Building and Managing Systems

Recommended Literature:


Comment: This lecture will be hold locally at YSU.

Technologies of Data Communication and Networking  
Lecturer: Prof. Vardan Matevosyan  
Module Composition: 2 SWS Lecture + 2 SWS Tutorials  
ECTS Credit Points: 6  
Content: This course introduces the student to a broad range of topics fundamental to computer communications.

- Computer Networks and the Internet, Circuit Switching and Packet Switching, OSI and TCP/IP protocol architectures
- Application Layer, Web and HTTP, SMTP, P2P applications
- Socket programming
- Transport Layer, UDP, TCP, Reliable Data Transfer, Congestion Control
- Network Layer, IP Protocol, ICMP
- Routing Algorithms, Routing in the Internet
- Link Layer, Error Detection and Correction Techniques, Link Layer Addressing
- Multiple Access Protocols, Local Area Networks, Ethernet
- Wireless Networks, 802.11 Wireless LANs, WiMax
- Security in Computer Networks, Cryptography, Integrity, SSL, VPN, Securing Wireless LANs, Firewalls
- Multimedia Networking, Protocols for Real-Time Interactive Applications, RTP, RTCP, SIP, H.323

Recommended Literature:


23
The Theory of Rational Databases

**Lecturer:** Prof. Manuk Manukyan  
**Module Composition:** 2 SWS Lecture  
**ECTS Credit Points:** 3  

- Formal Foundations of Relational Data Model  
- Algebra of Relational Models  
- Relational Calculus  
- Formal Foundations of Relational Database Schemas Design  
- Design of Relational Database Schemas  
- Multivalued Dependencies  
- Relational Query Languages  
- Logical Query Languages

**Required Textbook**  

**Recommended Literature**  

**Comment:** This lecture will be held locally at YSU.

GERMAN LANGUAGE TRAINING (18 ECTS credit points)

German Language for Beginners

**Lecturer:** Nana Berberyant  
**Module Composition:** 4 SWS Lecture (2 SWS Online, 2 SWS On-Site Lecture)  
**ECTS Credit Points:** 6  
**Content:** Students will develop the linguistic and intercultural knowledge, understanding and skills to communicate actively in German in interpersonal situations. Students will interpret and respond to texts, applying their knowledge and understanding of language and culture.

**Recommended Literature:**


**Comment:** This course is a preparation for more in-depth language courses.
EXAMINATIONS

Every module gets completed with the module examination. The number of examinations and the type and the amount of work load for the examination performance are taken from Examination Regulations for the Master’s program in Visual Computing, prepared at the University of Rostock.

The Master examinations process consists of course-related module examinations and the colloquium of the Master thesis. Normally, module examinations consist of one, with the maximum of two units of examination performance: a written examination (or other type of a written task) and/or an oral examination.

Course-related module examinations (in the form of a written exam or an oral exam) are taken within the stated examination time. The examination time for each semester starts at the first week right after the end of the lecture period and lasts until the beginning of the following semester. In special cases, module examination can take a form of presentations, colloquies, reports, term papers, tests and practical tasks. These types of examinations can take place right after the lectures, assuming the students were informed about the examination type, the amount of work and corresponding deadlines ahead of time, during the first week of lectures.

The student has to register for every module examination. The registration deadline is four weeks before the beginning of examinations period. The deadline for notification of module examinations that will take place during the semester is two weeks after the beginning of the lecture period. An extra registration for re-examinations is not necessary: it is carried out automatically if the examination is not passed; the re-examination takes place during the next module examination period. All the changes to this procedure are regulated by the examination board.

The dates of the examination period, the subjects being tested, and all corresponding deadlines are announced six weeks before the beginning of the examination time of the current semester. In case of examinations taking place during the lecture time, the announcement is made before the semester starts.

Further details are given in the Examination Regulations.
HOW DOES IT WORK?

During the first three semesters your Master Degree Program in Visual Computing is a time- and location-independent online study with attendance phases at the Yerevan State University. While the University of Rostock is carrying out the lectures as usual, the content of the courses is exported to Armenia via special system called “Lecturnity”. After being recorded and published online, all the lectures are accessible at anytime from any place. The system can be controlled like any video recorder. In addition, it allows the web-based discussion boards, where course-related exchanges take place. Computer laboratories at YSU are used for exercises and practices.

After three semesters of online and attendance study (called “Blended Learning”) in Yerevan, the Master thesis is written and defended at the University of Rostock in Germany during the fourth semester. Upon a successful completion of the double-degree Master’s program in Visual Computing, students receive Diplomas from both, the Yerevan State University and the University of Rostock.

The study takes four semesters and is comprised of exported lectures in English, on-site tutorials, on-site computer labs, exams, and the Master thesis. Additionally, German language skills are developed during the course of studies.

<table>
<thead>
<tr>
<th>1st -3rd Semester:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Lectures</strong> will be recorded in Rostock, enriched with accompanying learning material (e.g. handouts) and prepared for the online consumption, as well as handled in compact courses in both, Yerevan and Rostock</td>
</tr>
<tr>
<td>• <strong>On-site tutorials and computer labs</strong> in Yerevan will complement the online material</td>
</tr>
<tr>
<td>• The online lectures will be available to students <strong>regardless of time and location</strong></td>
</tr>
<tr>
<td>• <strong>Mentoring and laboratory services at YSU</strong> will be available to all students</td>
</tr>
<tr>
<td>• <strong>Optional Internships</strong> at the German and Armenian firms will translate theoretical knowledge into the practical experience</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exams</th>
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<tbody>
<tr>
<td>• <strong>Oral exams</strong> will be taken either via video conferencing or by the lecturers themselves in Yerevan</td>
</tr>
<tr>
<td>• <strong>Written exams</strong> will be conducted in Yerevan</td>
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<thead>
<tr>
<th>Block seminars and Summer schools</th>
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<tbody>
<tr>
<td>• During the free period of each semester, the University of Rostock and YSU organize block seminars/lectures and summer schools to support a deeper engagement between the students and instructors, as well as to further promote German language studies. These courses are prepared by teaching staff of the University of Rostock and YSU and are attended by both, students from the YSU and the Rostock University. Professional and intercultural competencies will be extensively promoted through experiences of an everyday life at a German university.</td>
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<tr>
<th>From 3rd Semester on (optional):</th>
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<tbody>
<tr>
<td>• <strong>An internship</strong> at a German company is strongly recommended</td>
</tr>
<tr>
<td>• <strong>The project team supports</strong> students in their search for an internship position</td>
</tr>
<tr>
<td>• <strong>An optional internship will extend the duration of study</strong></td>
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<table>
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<tr>
<th>4th Semester:</th>
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<tbody>
<tr>
<td>• <strong>Master thesis will be completed in Rostock</strong> (duration 6 months) and will be supervised by the lecturers from the University of Rostock and the YSU</td>
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<thead>
<tr>
<th>Degree</th>
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<tbody>
<tr>
<td>• Successful completion of the program will be acknowledged with an <strong>official diploma from</strong> the Yerevan State University and the internationally recognized <strong>Master of Science</strong> degree from the University of Rostock</td>
</tr>
</tbody>
</table>
APPLICATION PROCEDURE - WHO CAN JOIN?

Entry Requirements

- Bachelor of Science (or comparable degree)
- At least 30 credit points in Computer Science
- At least 27 credit points in Mathematics
- Proof of English language skills (iBT TOEFL score of at least 55% is required)

Admission Procedure

Please apply before the semester begins!!!
Information office in Yerevan: Ms. Jeannie Veytsman, 1 Aleq Manoogian St., Yerevan 0025 Armenia. Tel: +374 (0) 10 55 19 41. Email: jveytsman@ysu.am. A successful application requires all the documents required by the YSU for admission procedure and an entrance examination assessed by the lectures from Rostock (fill out the Application Form for Admission to Studies for Foreign Applicants and submit to Ms. Veytsman or send a complete package to the International Education Team in Rostock). Successful applicants will be admitted to the program, thus, becoming M.Sc. students at the University of Rostock and at YSU.

Charges and Scholarships

The tuition fee of 630.000 AMD is in line with the common prices for a comparable degree. The student fee of € 52.00 is mandatory for all Rostock University students and is due at the beginning of each semester.

From an application to the diploma
# CONTACT INFORMATION

<table>
<thead>
<tr>
<th>INFORMATION OFFICE, YEREVAN</th>
<th>PROGRAM COORDINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeannie Veytsman</td>
<td>International Education Team</td>
</tr>
<tr>
<td>1 Aleq Manoogian St.</td>
<td>Joachim-Jungius-Str. 9</td>
</tr>
<tr>
<td>Yerevan 0025 Armenia</td>
<td>Rostock 18059 Germany</td>
</tr>
<tr>
<td>Tel: + 374 (0) 10 55 19 41</td>
<td>Tel: + 49 (0) 381 498 7538</td>
</tr>
<tr>
<td>Email: <a href="mailto:jveytsman@ysu.am">jveytsman@ysu.am</a></td>
<td>Fax: + 49 (0) 381 498 7552</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIVERSITY OF ROTSTOCK, GERMANY</th>
<th>E-mail: <a href="mailto:armenia@ie-rostock.de">armenia@ie-rostock.de</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Computer Science &amp; Electrical Engineering</td>
<td></td>
</tr>
<tr>
<td>Albert-Einstein-Str. 21</td>
<td></td>
</tr>
<tr>
<td>Rostock 18059 Germany</td>
<td></td>
</tr>
<tr>
<td>Tel: + 49 (0) 381 498 7001</td>
<td></td>
</tr>
</tbody>
</table>

| Prof. Dr.-Ing. habil. Djamshid Tavangarian                                               |                                                     |
| Project Director                                                                         |                                                     |
| E-mail: djamshid.tavangarian@uni-rostock.de                                               |                                                     |
| Tel: + 49 (0) 381 498 7551                                                                |                                                     |

| Dr.-Ing. Saeed Zare                                                                        |                                                     |
| Project coordination and technical issues                                                  |                                                     |
| E-mail: saeed.zare@uni-rostock.de                                                          |                                                     |
| Tel: + 49 (0) 381 498 7520                                                                 |                                                     |

| Dipl.-Kff. Simona Rau                                                                      |                                                     |
| Study organisation and public relations                                                    |                                                     |
| E-mail: simona.rau@uni-rostock.de                                                          |                                                     |
| Tel: + 49 (0) 381 498 7520                                                                 |                                                     |

www.ie-rostock.de
ABOUT THE INFORMATION TECHNOLOGIES EDUCATIONAL AND RESEARCH CENTRE

IT Educational and Research Centre (IT ERC) is headed by Prof. Samvel Shoukourian, Doctor of Science in Physics and Mathematics, Academician of NAS RA.

Established in 2007, the Centre serves as an interdisciplinary hub for educational programs, for research in information science and technology, and for development and implementation of e-governmental and quality assurance information systems in education. Centre’s expertise is set in four main areas: traditional education, online and distance learning, scientific research, and advanced solutions for career development.

Master Programs

- Development of Information Systems,
- Management of Information Systems,
- Visual Computing.

Development of Information Systems program is an adaptation of an existing educational program in information systems design and verification to modern requirements for graduate programs. It was originally established in YSU in early 90s.

Management of Information Systems program is an implementation of a similar graduate program in IT management at the New York University. It was established in 1998 due to in-kind assistance and help of USAID.

Starting October 2010, the Centre, in cooperation with the Faculty of Computer Science and Electrical Engineering of the Rostock University (Germany), offers a new graduate program in Visual Computing. Visual Computing is a new direction in data acquisition, analysis and synthesis which is routed in computer graphics, computational geometry, image processing, computer vision, and machine learning. This is the first double degree graduate program in Armenia. It is implemented as part of a 3-year project supported by the German Academic Exchange Agency (DAAD). Its goal is to establish graduate programs that will grant double degrees in information science and technology.

Research in formal models of distributed systems, in electronic testing and recovery of memory devices and systems is a significant part of activities at the IT ERC. In addition to using modern learning technologies the centre also participates in their development. The development of Armenian Virtual College (www.avc-agbu.org) sponsored by Armenian General Benevolent Union is among Centre’s most recent accomplishments.

Contacts:

YSU, D4 build., 0025,
1 Alex Manoogian st., Yerevan, Armenia
Tel.: (+37410) 55-19-41
E-mail: it_center@ysu.am

Information about living in the city of Yerevan and about studying at YSU can be obtained locally at the admissions office or following the link www.ysu.am
ABOUT THE UNIVERSITY OF ROSTOCK

The University of Rostock is not only the oldest one in the Baltic Sea region but also the richest in tradition. Founded in 1419, soon it will celebrate its 600th anniversary and look back on a long tradition of educating students and doing research. It consists of nine traditional faculties and one central interdisciplinary faculty in which scientists and students from all faculties collaborate to do research in the three major fields of “Life, light and matter”, “Maritime systems” and “Aging sciences and humanities”. The University of Rostock is the largest university and employer in the north-east region of Germany with over 15,000 students and 6,000 employees. The university works together with many national and international companies, like Microsoft and Anova GmbH, and cooperates currently with 52 Universities in 25 countries. The research of the University of Rostock plays an important role, in particular for the aviation and space industry and the development of the medical technology.

Research

Research at the University of Rostock means successful interdisciplinary cooperation in various scientific fields. Side by side with the two Fraunhofer institutes, the Max-Planck-Institute of Demographic Research, the Leibnitz Institutes and the Research Institute for the Biology of Farm Animals, Rostock’s Alma Mater is the centre of a fruitful research environment. It offers an excellent research climate to its researchers and junior researchers in all fields, from humanities to natural sciences and engineering or life sciences.

The high research activity results into a great variety of projects in local, national and international networks. In addition, the University of Rostock is distinguished by an extraordinary research quality related to its academic profiling, the two collaborative research centres and three research groups. In addition to further development and advancement of its profile-creating research fields, the University of Rostock is particularly concerned to strengthen the co-operation in the scientific and business sector and to implement its scientific findings in profitable way.

Education and research started in Rostock even 73 years before Columbus discovered America as the university was founded already in 1419. A lot has changed in the meantime. Such as the technical faculty founded in 1951 - the first one ever established at a classical university. Plenty of new, modern buildings, as the completely new campus for natural sciences in the district Suedstadt, represent the innovative strength and modernity of the university.

Faculties

The University of Rostock has nine faculties divided up into a large number of institutes or clinics. The range of subjects on offer comprises a broad scope of more than 70 different courses of study. Hence the University of Rostock is counted among those institutions of higher learning in Germany with the widest spectrum of subjects.

- Faculty of Agricultural and Environmental Sciences
- **Faculty of Computer Science and Electrical Engineering**
- Faculty of Law
- Faculty of Mechanical Engineering and Marine Technology
- Faculty of Mathematics and Natural Sciences
- Faculty of Medicine
- Faculty of Humanities
- Theological Faculty
- Faculty of Economic and Social Sciences
ABOUT THE FACULTY OF COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

Computer science and electrical engineering are interdisciplinary technologies which have attained exceptional significance in all areas of daily life, one prime example being their importance in modern technologies. This faculty, which is divided into the two departments of Computer Science and Electrical Engineering, meshes the science of automated information processing with the science concerned with the technical applications of the tenets of physical electricity. The research at this faculty focuses on the fields of communication and information science, life science engineering and biosystems engineering, maritime systems and processes as well as regenerative medicine. The Faculty of Computer Science and Electrical Engineering is very closely working with the economy. Siemens, for instance, is one of the most well-known partners.

City of Rostock with the Faculty of Computer Science and Electrical Engineering

More information:

ABOUT THE CITY OF ROSTOCK

Rostock – A beautiful Hanseatic City with its own seaside resort. The biggest (over 200,000 residents) and most important city of the German federal state Mecklenburg-Vorpommern is a gateway to the Baltic Sea. The historic city center breathes Hanseatic flair. Visitors will find valuable witnesses of north German Gothic brick architecture; apart from churches there are also convents, a city wall, gates and gabled houses. In the seaside resort of Warnemünde there’s also more than just magical coastal scenery and beautiful wide sandy beach. It has become a Mecca for swimming, sunbathing, walking and wellbeing. Warnemünde offers many maritime experiences, from the lighthouse to the fishermen’s huts, imposing cruise liners in the summer and one of the best sailing patches in the world.

Rostock is located on the axis Berlin - Copenhagen (Denmark) and Hamburg – Stettin (Poland). It is reachable by the motorways A19 and A20, by the airport Rostock-Laage and also by an express way connection from and to Berlin and Hamburg (both cities are accessible in 2 hours by car or train). There are ferry lines between Rostock and Gedser/Denmark, between Rostock and Trelleborg/Sweden, between Rostock and Ventspils/Latvia as well as between Rostock and Helsinki/Finland in regular intervals.

The Hanseatic university city of Rostock is a great place to study, research and live. The economic and scientific center of the North-East is very enticing, with all the atmosphere of a major city in the middle of one of the most beautiful tourist areas in Germany. Discover our benefits for yourself! We look forward to see you in Rostock.
ADDITIONAL FEES (in Rostock)

Costs of living in Rostock

The cost of living depends on your lifestyle. However, you cannot influence the average rents or the cost of food and health insurance! So, just being thrifty is not going to help.

The cost of living is noticeably higher than in many other countries, but Europe-wide cost-of-living-ranking shows that the cost of living in Germany is often cheaper than in Scandinavian countries or in France or Britain. Especially food can be very cheap if you buy it in one of the many discounters like ALDI or LIDL.

The largest monthly expense for you is the rent – mostly a third of your total cost living. In German comparison of larger University Cities, Rostock’s rents are in the middle. But there are differences in the cost of living in Rostock. In downtown the rents are the highest. Average costs are approximately 200 Euro the month. In return you get a small apartment in the suburban or a room in a shared apartment in the City. It is also possible to get a place in one of the student hall of residence.

Notice: You have to take care of renting an apartment or a place in the student hall of residence at least half a year before your abidance in Rostock. Please contact the International Education Team in Rostock or Ms. Jeannie Veytsman sufficiently in advance for help!

On average German students have about 770 Euro per month available. Mostly, international students have less money than their German counterparts and have to manage on an average of about 630 Euros. (source: 18. Sozialerhebung, 2006)

But there are also lots of special rates if you use a Student Identity Card. Whether tickets for the theatre, museum, cinema, newspaper subscriptions, train, flight tickets or mobile phone rates. If you present your student ID card you can get a discount.

It is also advisable to get an “International Student Identity Card” (ISIC). This card is recognized worldwide and earns student price reductions and discounts in more than 110 countries. It costs 10 Euro, is valid for 16 months and is available from student travel agents, student councils or from the student service organization at university.

Some selected price examples for food, culture and shopping in Rostock:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 loaf of bread</td>
<td>1,- to 2,- Euro</td>
</tr>
<tr>
<td>1 liter of milk</td>
<td>0,55,- Euro</td>
</tr>
<tr>
<td>1 kg potatoes</td>
<td>0,99,- Euro</td>
</tr>
<tr>
<td>1 bottle of mineral Water (1,5 Liter)</td>
<td>0,19,- Euro</td>
</tr>
<tr>
<td>1 glass of beer (at a bar)</td>
<td>2,50,- Euro</td>
</tr>
<tr>
<td>1 pizza (at a restaurant)</td>
<td>4,- to 7,- Euro</td>
</tr>
<tr>
<td>1 meal in the student canteen</td>
<td>1,50,- to 3,- Euro</td>
</tr>
<tr>
<td>1 movie ticket</td>
<td>3,- to 8,- Euro</td>
</tr>
<tr>
<td>1 ticket for the theatre</td>
<td>5,- (reduced fare)</td>
</tr>
<tr>
<td>1 pair of shoes</td>
<td>20,- to 100,- Euro</td>
</tr>
</tbody>
</table>
DAAD - SUPPORT OPPORTUNITIES

Information on the DAAD Scholarship Program 2011/2012 (Armenia)

You can find the appropriate announcements for the chosen program in the DAAD Scholarship Database (www.daad.de)

Please contact the DAAD office in Yerevan:

Mrs. Tine Laufer
Baghramian-Str. 50
0019 Yerevan

Phone: 00374-10210306
E-Mail: info@daad.am
www.daad.am