4 Teaching Profile

4.1 Overview Courses, Laboratories

Table 4.1 presents an overview of the lectures, exercises, and laboratories offered by ComNets. A brief description of its contents is presented in 4.2.

Table 4.1: Courses and Laboratories

Course	**Sem.**[1]	**L/E/P**[2]	**Period**	**Lecturer**
Basic Studies				
Basics of [12] Computer Science III	3	2/1/0	WS[3]	Walke
Applied Computer Science Laboratory I	1	0/0/4	WS[3]	Walke
Graduate Studies				
Communication Networks and Traffic Theory I[6]	7	2/1/0	WS	Walke
Communication Networks and Traffic Theory II[6]	8	2/1/0	SS	Walke
Communication Networks Laboratory	8	0/0/3	SS	Walke
Mobile Radio Networks and Protocols I	7/9	2/1/0	SS	Walke
Mobile Radio Networks and Protocols II	8	2/1/0	WS	Wietfeld[10]
Communication Protocols[11]	7/9	2/1/0	WS	Walke
Stochastic Simulation I	5/7	2/1/0	WS	Rokitansky
Stochastic Simulation II	6/8	2/1/0	SS	Rokitansky
Stochastic Simulation Laboratory		0/0/4	WS	Walke, Rokitansky
Mobile Radio Networks	6/8	0/0/4	SS	Walke

Table 4.1: Courses and Laboratories (continued)

Course	Sem.[1]	L/E/P[2]	Period	Lecturer
Laboratory				
Switching Systems	5/7	2/1/0	WS	Niebert[7]
Local Area Networks for Industrial Applications	7/9	2/1/0	WS	Schumacher[8]
Patent Law I	5/7	2/1/0	WS	Metz[9]
Patent Law II	6/8	2/1/0	SS	Metz
CORBA Project	≥5	0/0/4	both	Gebhardt
UML Project	≥5	0/0/4	both	Gebhardt

[1] Semester
[2] Lectures/Exercises/Laboratories in weekly hours (45 min.)
[3] SS = summer semester, WS = winter semester
[6] Obligatory for students of the computer science study branch
[7] Lecture by Dr.-Ing. N. Niebert (Ericsson Eurolab Deutschland, Herzogenrath)
[8] Lecture by Prof. Dr.-Ing. H. Schumacher (IBM Deutschland, Böblingen)
[9] Lecture by S. Metz (Patent lawyer)
[10] Lecture by Dr.-Ing. C. Wietfeld (Siemens, Berlin)
[11] Master of Commun. Engineering
[12] before 2001: Applied Computer Science

4.2 Lecture Descriptions

Basics of Computer Science III This lecture is subtitled "Computer Organization and System Performance". The focus is computer organization. Students are introduced into such aspects of computer organization that are important for the understanding of the actual information and communication technology and current trends in this area.

Communication Networks and Traffic Theory I Basic reference model for Open Systems Interconnection (OSI), functions of the 7 layers of the ISO/OSI reference model. Formal specification of protocols in SDL (including computer aided exercises), basic terms of telecommunication engineering, signals, information-theoretical basic principles and basics of digital transmission: impulse forming, baseband, carrier band, channel coding, multiplex techniques (time, frequency, space), line interfaces, synchronization. Transmission control by character/bit oriented protocols, medium access control and error control. Local area network and

digital (ISDN) branch exchanges. Network layer: (virtual) connections, routing, addressing. Data networks and ISDN. Fundamentals of SDH and ATM networks. Signaling system SS.7, Internet protocols and services.

Communication Networks and Traffic Theory II Introduction to random processes. Theory and application of Markov-processes. Introduction to system modelling and queueing theory. Classification and general analysis of queueing systems. In depth presentation of queueing systems of the types M/M/s, M/G/1 and others. The classical loss-formula of Erlang and Engset; mean value formula of Pollaczek and Khintchine. Preemptive and non-preemptive priority disciplines. Open/closed queueing networks, (Jackson, Gordon and Newell, BCMP), mean value analysis.

Local Area Networks for Industrial Applications Communication structures of an enterprise. Positioning of local area networks. Token Ring, Token Bus, Ethernet. Manufacturing Message Specification (MMS). Manufacturing Automation Protocol. Profibus, Interbus-S, CAN-Bus, FIP, LON. Intercompany Electronic Data Interchange.

Switching Systems Switching systems-fundamentals: Overview, history, network elements and network structures. Current networks switching aspects: ISDN, GSM and the concept of the "Intelligent Network" Management of telecommunication networks TMN. Realization of advanced telecommunication services: UPT and VPN. Signaling and protocols: SS#7, ISUP, MAP. Broadband communication network: ATM. Preview on future systems: UMTS, "information networks", multimedia services, performance analysis. At the end of the lecture an excursion is offered to Ericsson Eurolab Deutschland (EED).

Mobile Radio Networks and Protocols I, II Radio propagation, the cellular concept, selected basics of radio transmission. Functional description of the following networks: Cellular mobile radio networks (GSM and DCS 1800). Paging systems, trunked mobile radio TETRA, cordless telephone (CT1/2, DECT), HiperLAN, UMTS, Satellite radio networks. Multiple access control protocols and their traffic performance. Multihop packet radio networks.

Stochastic Simulation I and II Methods of stochastic simulation for the performance analysis of systems, modelling, random generators, load

generators, statistical evaluation, simulation systems (CNCL, OPNET, BONeS, MODSIM, ...), methods for simulation speed up, models of communication networks (FDDI, Ethernet, mobile systems, DECT, ...), generating simulator models from SDL protocol specifications.

4.3 Laboratory Descriptions

Communication Networks

- Specification and implementation of the alternating-bit protocol in SDL.
- ATM-Signaling Protocols.
- Hand-over in GSM radio mobile network.
- Data transmission with GSM in the non-transparent mode.
- Protocol analysis of data transmission via Ethernet LAN.
- Protocols of the ISDN basic and primary rate interfaces.
- Development of voice based services for intelligent networks.
- Planning and evaluation of DECT systems.

Mobile Radio Networks This laboratory is offered the first time in SS 2002. Seven experiments have been prepared:

- Radio Network Planning
- Core Network Planning
- Measurement of Services in a live GSM/GPRS-Network
- Quality of Service in Group Communication with Trunked Radio Networks
- Performance Analysis of WLANs
- Mobile Communication based on LEO satellites: Protocol requirements and performance analysis
- Session Initiation in Mobile Client/Server Architecture

Stochastic Simulation of Digital Networks Protocols Stochastic simulation of protocols of wireless LANs. The application of the object oriented programming language C++ and the class library CNCL on stochastic simulation will be demonstrated an exercised on UNIX systems. Also the application of stochastic basics on simulation will be exercised. The SDL specification language will be compared with the C++ programming language.

4.4 Project Description

CORBA-Project The CORBA Project is compliant to the new study regularities DPO'98. The evaluation of ORBs (Object Request Broker) is a project task, which can be solved successfully only by a team. Therefore project management will explicitly be considered. Members (at most 5) of the project specify, plan and control the project, also quality. One member will act as project manager. The teacher acts as moderator. The objective of the project is to get familiar with the principle steps of the evaluation of ORBs including practical skills. The project will be documented in a report on the base of TeX. The results will be shown in a 45 minutes slide presentation session.

UML-Project This project has been carried out for the first time in SS 2002 instead of the originally offered CORBA-project at the request of students. The project task is a comparative study of GSM evolution path and 3G system (UMTS) with respect to spectrum efficiency. In the analysis part basic knowledge of radio transmission is extracted from literature and integrated into UML-class diagrams. The objective of this part is to specify a transmission model that can be considered as a meta model for comparative studies. The comparison itself starts with typical load scenarios (voice, streaming, www-session) generating traffic and related requirements. The discussion how both technologies can carry the traffic uses the meta model with the related class diagrams. The complexity of the project task needs teamwork and project organization so that learning by doing is applicable. The project will be documented in a report and the results will be shown in a 45 minutes slide presentation session.

4.5 Student Examinations

Student examinations are held twice per year in spring and autumn. Table 4.2 contains the number of examinations performed within the past two years. It also includes participations in laboratories offered at the chair and completed student projects and diploma theses.

Table 4.2: Number of Examined Students

Course	2000	2001	2002[1]
Applied Computer Science III	230	205	29
Communcation Networks I+II	97	110	34
Mobile Radio Networks and Protocols I + II	18	31	15
Stochastic Simulation in Communication Network Applications	10	4	2
Communication Protocols MSC	-	-	11
Switching Systems	7	3	1
Local Area Networks for Industrial Applications	6	10	12
Patent Law	20	38	19
Applied Computer Science Laboratory I	297	340	363
Communication Networks Laboratory	24	23	-
Stochastic Simulation Laboratory	6	7	9
Student Project CORBA	17	4	-
Student Project UML			4

[1] only spring or as far as available
[2] held in SS
[3] held in WS