Technology Arts Sciences
TH Köln

Course Manual NGN

Next Generation Networks

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— General information

Long name	Next Generation Networks
Approving CModule	NGN_MaCSN, NGN_MaTIN
Responsible	Prof. Dr. Andreas Grebe Professor Fakultät IME
Valid from	summer semester 2021
Level	Master
Semester in the year	summer semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Andreas Grebe Professor Fakultät IME

Literature

J. Kurose, K. Ross: Computer Networking: A Top-Down Approach, Global Edition, Prentice Hall, 7th ed., 2016

A. S. Tanenbaum, D. J. Wetherall: Computer Networks, Pearson , 5th ed., 2013

U.Trick, F. Weber: SIP und Telekommunikationsnetze: Next Generation Networks und Multimedia over IP – konkret, De Gruyter Oldenbourg Verlag, 4. Auflage 2015

J. F. Durkin: Voice-enabling the Data Network,Cisco Press 2010

G. Camarillo, M.A. García-Martín: The 3G IP Multimedia Subsystem (IMS), John Wiley Verlag, 2006

W. Stallings: Foundations of Modern Networking, Pearson Education, 2016

J. Doherty: SDN and NFV Simplified, Pearson Education, 2016

J. Edelman: Network Programmability and Automation, O'Reilly 2018

J. van Meggelen, R. Bryant, L. Madsen: Asterisk: The Definitive Guide: Open Source Telephony for the Enterprise, O'Reilly Media, 5th Ed. 2019

Final exam

Requirements	Bachelor-level knowledge of protocols and layer models, Internet protocols (UDP, TCP, IP, HTTP, FTP), IP addressing (IPv4, IPv6), routing techniques (IP routing, functionality of a router, routing protocols, RIP, OSPF), transmission systems and layer 2 protocols, Ethernet. Understanding distributed systems and applications, sockets and client/server programming, request-response patterns, publishg-subscribe patterns.	**Details**	In a final examination (oral, optionally written), the students demonstrate their competences in summary form. The examination comprises the following sections, in which six taxonomy levels are included (reproducing, understanding, applying, analysing, synthesising, and evaluating). 1.) A good understanding of basic terminology, concepts and techniques. 2.) Application of planning and evaluation techniques. 3.) Evaluation of proposed solutions for correctness, identification of errors in statements or given networks.
Language	English		
Separate final exam	Yes	**Minimum standard**	Achievement of the individual minimum score per exam, typically 50% of maximum score.
		Exam Type	EN Klausur

Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	Achive basic understanding and implementation knowledge on Next Generation Network (NGN) defintion by ITU-T, IP Multimedia Subsystem by 3GPP, and ETSI, and Next Generation Internet (NGI) definition by IETF, ITU-T standards, Multimedia Services in NGN, VoIP, Video-over-IP, RTP encaplsulation, Service Signaling, SIP protocol, SIP Digest Authentication, SDP service description and capabilities, SIP servers, Session Border Controller (SBC), SIP Gateway Technologies, SIP routing, NAT Gateways, NAT solution, SRR, STUN , TURN, IMS in mobile networks, IMS in fixed-line networks, VoIP in enterprise networks. IMS in virtualized core network.
Skills	Students evaluate requirements for NGN services and plan, implement and analyze NGN services based on SIP signalling or alternative signalling protocols. They are competent in functional analysis and troubleshooting by deep packet inspection (DPI) protocol analysis. They evaluate the performance of NGN services in terms of timing, throughput, latency and delays, jitter, robustness in case of packet errors, and security aspects.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0
Tutorial (voluntary)	0

Special requirements

IP Networking and Protocols (Bachleor Niveau)

Accompanying material	Online materials: Slides for the lecture Exercises sheets Tutorials for tools (e.g. Wireshark) Material collections such as IOS command list, ASCII character table Optional: Network simulator tool Cisco PacketTracer Optionally, participation in two Cisco Academy CCNA (Cisco Certified Network Associate) modules is possible. The contents of the CCNA 2 and CCNA 3 modules are then also available as material.
Separate exam	No

− Practical training

Learning goals

Goal type	Description
Knowledge	Naming, structuring and classifying concepts and technologies for NGNs or NGIs. Demonstrate network analysis techniques and tools, know methods for NGN services and network planning.
Skills	Working on a small project in a tiny team (2-3 team members) on actual technologies in the area of NGN services and NGI services. Set-up an NGN/NGI environment and NGN service, including planning, implementation and evaluation of security aspects and protocol anlaysis plus performance evaluation. The results are reviewed during the course period, summarised in a report and presented to the class. Individual project proposals by students are wellcome.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Special requirements

IP Networking and Protocols (Bachleor Niveau)

Accompanying material	Online materials: Default Lab Instructions Tutorials for tools (e.g. Wireshark) Links to HowTo/Websites Material collections such as IOS command list, ASCII character table Optional: Network simulator tool Cisco PacketTracer
Separate exam	Yes

Separate exam

Exam Type	EN praxisnahes Szenario bearbeiten (z.B. im Praktikum)
Details	Several lab appointments with different tasks are to be attended, to solve a lab project. The following tasks are to be completed: Independent solution of the planned tasks and milestone presentation. Preparation of a final report. Final presentation of the results.
Minimum standard	Successful participation in all lab dates. Successful implementation of the lab project.