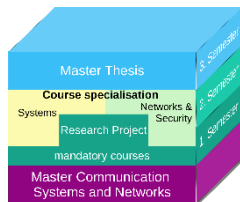




Master-Program Communication Systems and Networks

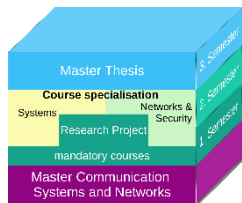
Faculty 07: Informations-, Media- and Electrical Engineering

Prof. Rainer Kronberger





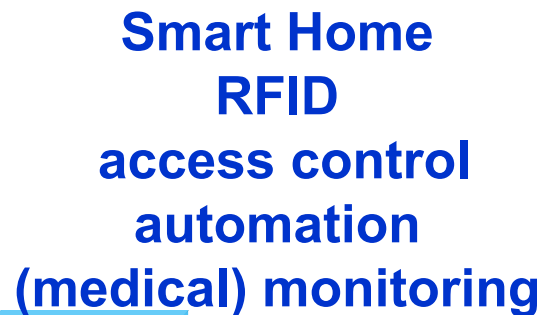
- General Information about the Program
- Information from the Examination Service
- Information from the International Office



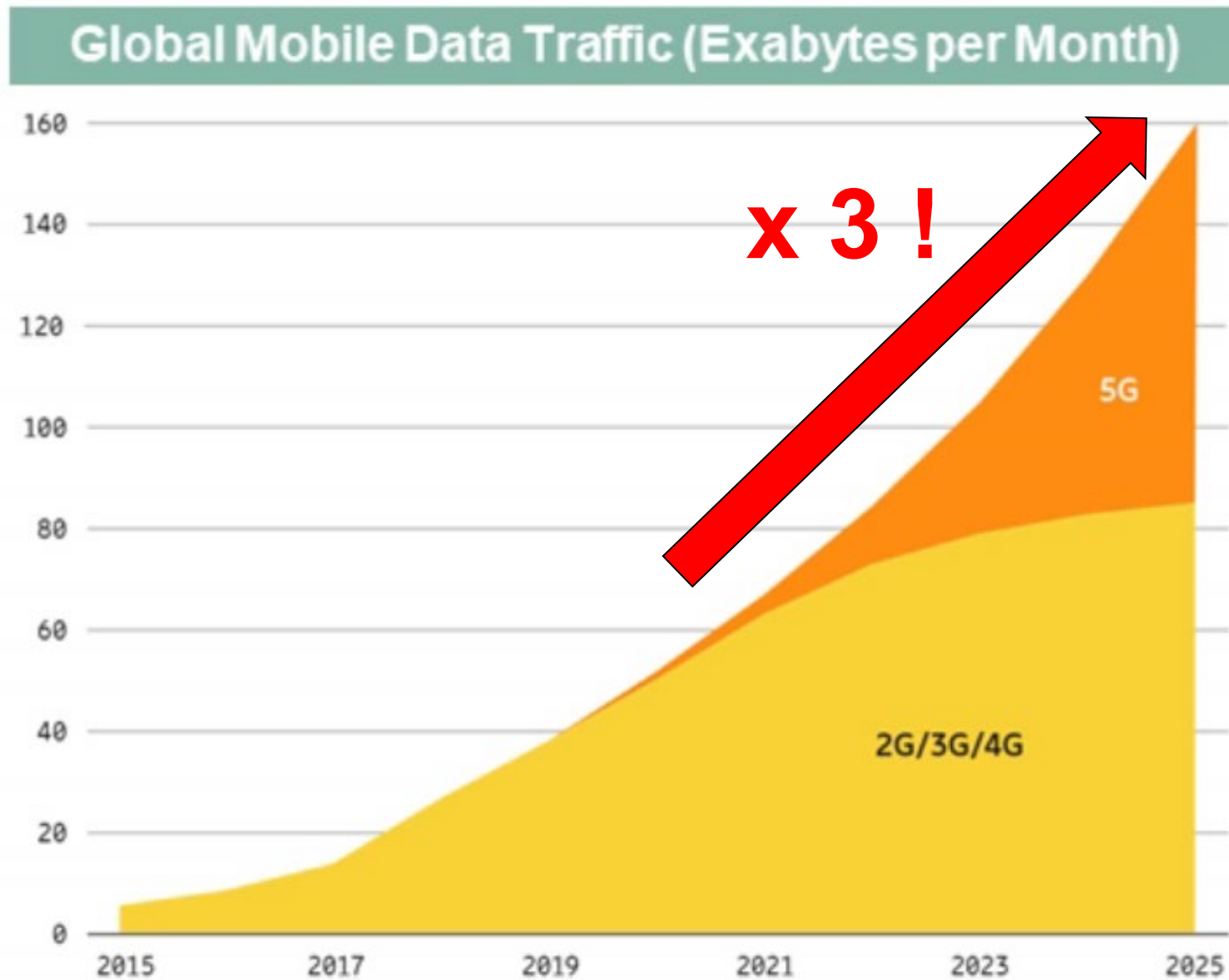


4G, 5G, 6G

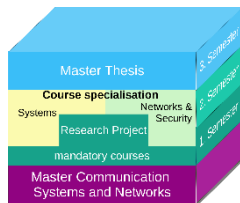
IoT



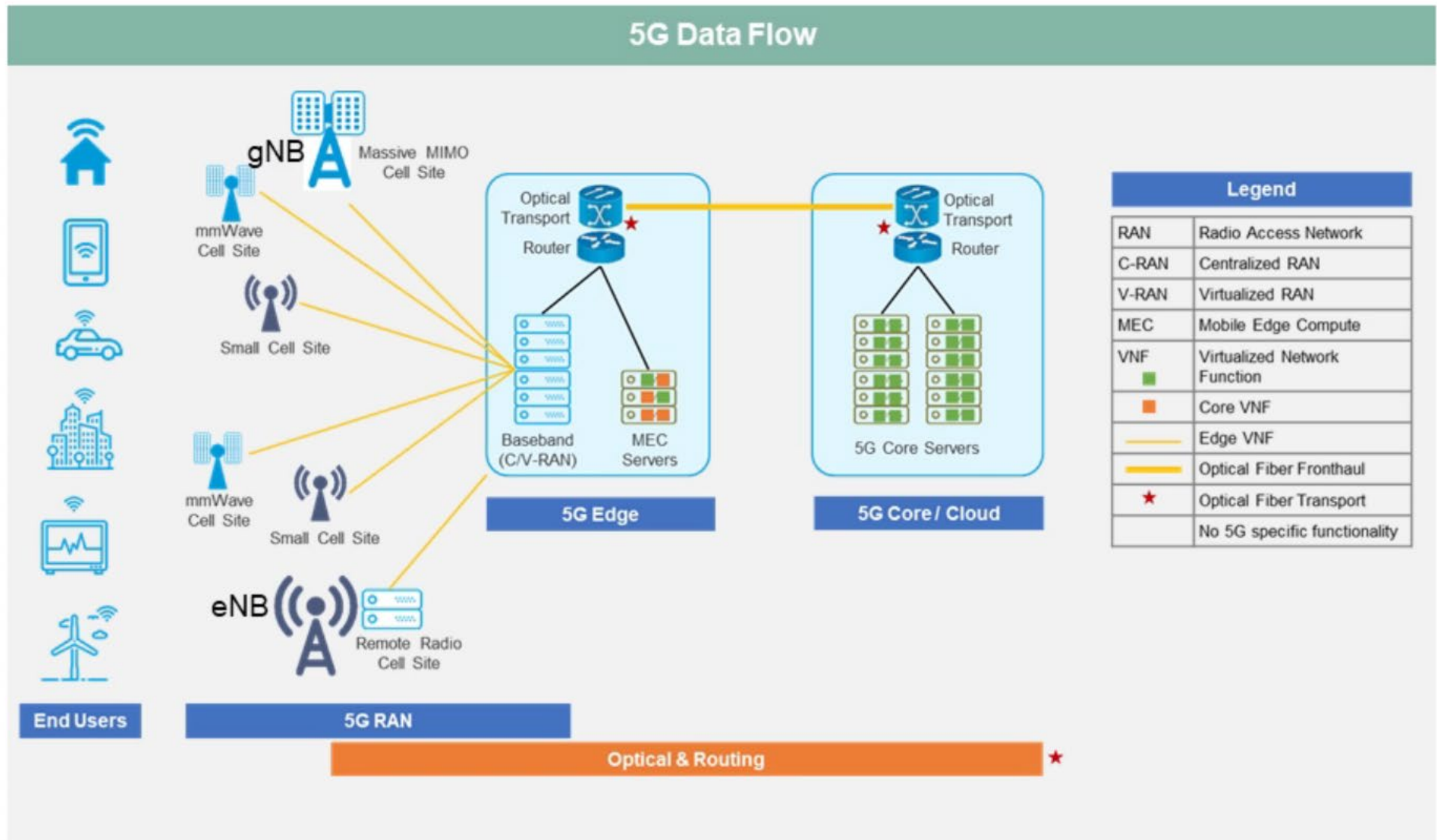
Communication Systems and Networks



Source: Ericsson Mobility Report, Nov 2019



Communication Systems and Networks



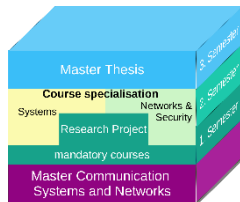
Source: Jim Nelson, „Power for Open Edge Applications“, OCP Summit, 2020.
5G Core=5G Backbone

Source: hindawi.com

Communication Systems and Networks

A university program with perspective?

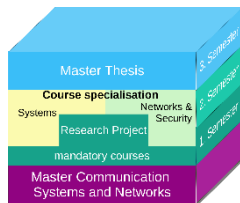
- Job possibilities worldwide in:
 - ⇒ telecommunication industry
 - ⇒ all other industries (IoT, Automotive, etc.)
 - ⇒ small and medium sized enterprises
 - ⇒ research institutes and universities (PhD possibility)
 - ⇒ public services (M.Sc → higher level)
- Significant higher earnings than B.Sc.



Communication Systems and Networks

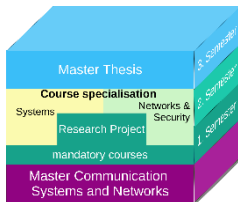
A university program with perspective?

- Great demand for master graduates! Currently, it is not covered!
- Fields of activity
 - ⇒ Design, development and implementation of modern communication systems and networks
 - ⇒ Development of devices, components, protocols and applications
 - ⇒ Evaluation and analysis of procedures and methods
 - ⇒ Assessment and evaluation of communication systems and standards
 - ⇒ Project management
 - ⇒ Sales and marketing of IT products
 - ⇒ Research at universities and institutes
 - ⇒ consulting and training of user and clients



Profile and Achievements

- focus of the study program:
 - consolidation of the theoretical knowledge in combination with practical scientific work
- nearly each module is supplemented by lab work
- students have to conduct an individual R&D work in the framework of a university or external research project to improve their scientific capabilities
- a broad range of further modules from the fields of electrical engineering, optical technologies, informatics, and media technologies is offered as electives by cooperation between TH-K and the H-BRS.



General Requirements

■ Bachelor in

- Electrical / Telecommunication Engineering
- Information Engineering / Computer Science
- or similar programs

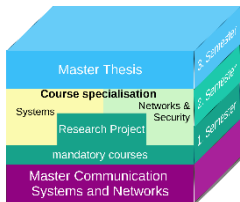
with at least 180 ECTS (additional assignments) resp. 210 ECTS

■ Major interest in Information and Communication Technologies

For all those of you who have got ***conditional admission***:

Please contact Prof. Kronberger (by mail) immediately to discuss your working plan for earning the missing credits!

(Provide name and student number in your mail!)



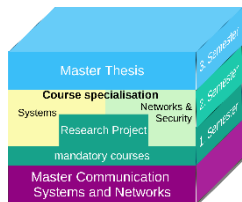
■ Faculty 07 (Institut for Communication Engineering INT), TH Köln

- Profs. Dettmar, Elders-Boll, Grebe, Knospe, Kronberger, Pörschmann, Silverberg, Rhein



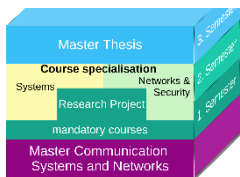
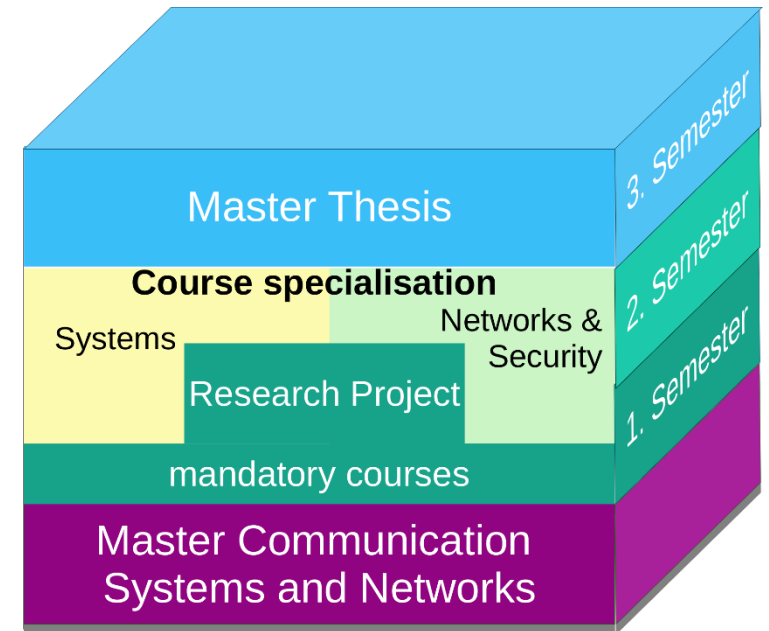
■ Fachbereich Informatik, HS Bonn-Rhein-Sieg

- Jonas, Jung, Lemke-Rust , Östreich, Reinert, Uhde,



MaCSN program structure

- **1. Semester: main subjects**
- **2 specialisations already starting 1. semester**
 - ⇒ *Communication Systems (E; TH-K)*
 - ⇒ *Communication Networks (D,E; TH-K, B-R-S (including IT-Security aspects))*
- **research project (10 ECTS)**
- **language**
 - ⇒ All courses in English at TH-K (lectures, excercises, projects, thesis)
 - ⇒ mainly German in HS BRS
- **Start**
 - ⇒ **regular summer term**
 - ⇒ **start in winter term in October with slightly changed schedule**



Regular start →
summer term

Start →
winter term

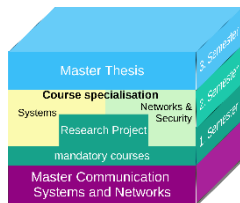
Module-ID	Module Name	Credits
1. Semester		
HIM	Advanced Mathematics (In English) mandatory	5
BSN	Basics on Systems and Networks mandatory	5
PFM1	Profile Module 1 (3) of the corresponding specialisation	5
PFM2	Profile Module 2 (4) of the corresponding specialisation	5
EL1	Elective 1 (3) from Master modules with technical content	5
PM	Project Management (In English) mandatory	5
RP	Research Project mandatory	10
2. Semester		
HIM	Advanced Mathematics (in German)	5
PFM3	Profile Module 3 (1) of the corresponding specialisation	5
PFM4	Profile Module 4 (2) of the corresponding specialisation	5
EL2	Elective 2 (1) from Master modules with technical content	5
EL3	Elective 3 (2) from Master modules	
PM (PL)	Projectmanagement/Projektleitung (in German)	5
RP	Research Project	10
3. Semester		
MAA	Master Thesis	
KOLL	Colloquium / Final Presentation	3
offered in both Semester		

No ULP

No ULP

No ULP

No ULP



This is the minimum planned time! It is on you, what time you need/have to complete the program!

Specialisation courses

Communication Systems course specialisation modules (choose 4 out of n)		Language	Site	Semester
M.ACC	Advanced Channel Coding	E	K	SS
M.VAE	Virtual Accoustic Environment	E	K	SS
M.ODUN	Optische u. drahtlose Übertragungsnetze	G (E)	B-R-S	SS
M.RFSD	RF System Design	E	K	SS
M.KRY	Cryptography	E	K	SS
M.NGN	Next Generation Networks	E	K	SS
M.DSP	Digital Signal Processing	E	K	WS
M.AMC	Advanced Multimedia Communications	E	K	WS
Networks & Security course specialisation modules (choose 4 out of n)				
M.AMC	Advanced Multimedia Communications	E	K	WS
M.KVS	Kommunikation in verteilten Systemen	E/G	B-R-S	SS/WS
M.ZK	Zuverlässigkeit von Systemen	G (E)	B-R-S	WS
M.SN	Servicemanagement in Netzen	G (E)	B-R-S	WS
M.IS	IT Security	E	K	WS
M.KRY	Cryptography	E	K	SS
M.VPN	Virtuelle Private Netze	G	B-R-S	WS
M.PET	Identification and Privacy Enhanced Technologies	G (E)	B-R-S	SS
M.EBS	Embedded Security	G	B-R-S	SS
M.NGN	Next Generation Networks	E	K	SS

Legend

E: English

G: German

K: Cologne

B-R-S: St. Augustin

E/G

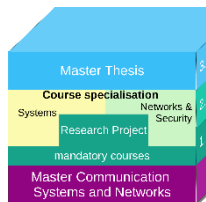
summer term: English, winter term: German

WS

winter term

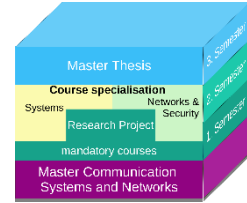
SS

Summer term



Curriculum

Module-ID	Module Name	Credits
1. Semester		
HIM	Advanced Mathematics (In English) mandatory	5
BSN	Basics on Systems and Networks mandatory	5
PFM1	Profile Module 1 (3) of the corresponding specialisation	5
PFM2	Profile Module 2 (4) of the corresponding specialisation	5
EL1	Elective 1 (3) from Master modules with technical content	5
PM	Project Management (In English) mandatory	5
RP	Research Project mandatory	10
2. Semester		
HIM	Advanced Mathematics (in German)	5
PFM3	Profile Module 3 (1) of the corresponding specialisation	5
PFM4	Profile Module 4 (2) of the corresponding specialisation	5
EL2	Elective 2 (1) from Master modules with technical content	5
EL3	Elective 3 (2) from Master modules	
PM (PL)	Projectmanagement/Projektleitung (In English)	5
RP	Research Project	10
3. Semester		
MAA	Master Thesis	27
KOLL	Colloquium / Final Presentation	3
offered in both Semester		



Specialisation courses

Communication Systems course specialisation modules (choose 4 out of n)		Language	Site	Semester
M.ACC	Advanced Channel Coding	E	K	SS
M.SAE	Simulation of Accoustic Environments	E	K	WS
M.ODUN	Optische u. drahtlose Übertragungsnetze	G (E)	B-R-S	SS
M.RFSD	RF System Design	E	K	SS
M.KRY	Cryptography	E	K	SS
M.NGN	Next Generation Networks	E	K	SS
M.DSP	Digital Signal Processing	E	K	WS
M.DLA	Deep Machine Learning	E	K	WS
M.AMC	Advanced Multimedia Communications	E	K	WS
Networks & Security course specialisation modules (choose 4 out of n)				
M.AMC	Advanced Multimedia Communications	E	K	WS
M.KVS	Kommunikation in verteilten Systemen	E/G	B-R-S	SS/WS
M.ZK	Zuverlässigkeit von Systemen	G (E)	B-R-S	WS
M.SN	Servicemanagement in Netzen	G (E)	B-R-S	WS
M.IS	IT Security	E	K	WS
M.KRY	Cryptography	E	K	SS
M.VPN	Virtuelle Private Netze	G	B-R-S	WS
M.PET	Identification and Privacy Enhanced Technologies	G (E)	B-R-S	SS
M.EBS	Embedded Security	G	B-R-S	SS
M.NGN	Next Generation Networks	E	K	SS

Legend
E: English K: Cologne
G: German B-R-S: St. Augustin

E/G summer term: English, winter term: German
WS winter term
SS Summer term

Modules of the MA CSN

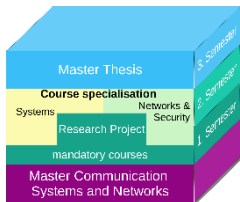
- The modules descriptions can be found in the WWW under <http://www.mcsn.de/> and then under the category **For Students**

- ✓ TH Köln follow the link

http://f07-studieninfo.web.th-koeln.de/f07_handbuecher_2020/html_pdf/SgVerzeichnis.html

- ✓ H Bonn-Rhein-Sieg follow the link

http://live-inf.h-brs.de/Aktuelles_Semester_MCSN.html



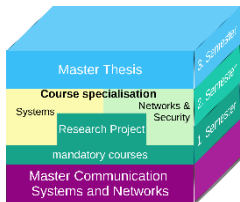
E-Learning MA CSN

- Professors from TH Cologne will do Online lectures via ZOOM and will present course material and latest information in the E-Learning platform **ILIAS** of TH Cologne

See: <https://ilias.th-koeln.de> and choose

F07 - Faculty of Information, Media and Electrical Engineering

- Please register for each course. Most courses require a PW, which will be given by the professor.
- Request access at HS B-R-S. System is different!



Class Schedules TH K

Monday

Tag	Std	Zeit	MACSN			
Mo	1	8:00			Oberheide	PLET
Mo	2	8:50			ZO 6-1	S
Mo	3	9:45			Oberheide	PLET
Mo	4	10:35			ZO 6-1	S
Mo	5	11:30			Oberheide	PLET
Mo	6	12:20			ZO 6-1	S
Mo	7	13:15			Knospe	V
Mo	8	14:05			KRY	V
Mo	9	15:00			ZO 6-8	Ü
Mo	10	15:50	S	P	P	
Mo	11	16:45	Erkan	Grebe	Knospe	
Mo	12	17:35	PM	NGN	KRY	
Mo	13	18:30	ZO 6-8	ZO 8-7	ZO 6-10	

Tuesday

Di	1	8:00				
Di	2	8:50				
Di	3	9:45	Kronberger	BSN	Elders-Boll	BSN
Di	4	10:35	ZO 6-8	V	ZO 6-8	V
Di	5	11:30	Kronberger	BSN	Dettmar	BSN
Di	6	12:20	ZO 6-8	Ü	ZO 6-8	Ü
Di	7	13:15				
Di	8	14:05	P			
Di	9	15:00	Dettmar			
Di	10	15:50	ACC			
Di	11	16:45	ZW 7-2			

V: Lecture Ü: Exercises P: LabWork

Wednesday

Mi	4	10:35				
Mi	5	11:30	Kronberger	RFSD	V	ZW 7-2
Mi	6	12:20	Kronberger	RFSD	V	ZW 7-2
Mi	7	13:15	Kronberger	RFSD		
Mi	8	14:05	ZW 7-2	Ü		
Mi	9	15:00				
Mi	10	15:50				
Mi	11	16:45	Seidel	CCNA3-4		
Mi	12	17:35	ZW 8-3	P		
Mi	13	18:30	Seidel	CCNA3-4		
Mi	14	19:20	ZW 8-3	P		

Thursday

Do	5	11:30	Rhein	HIM	V	ZW 8-3
Do	6	12:20	Rhein	HIM	V	ZW 8-3
Do	7	13:15	Rhein	HIM	S	ZW 8-3
Do	8	14:05	Rhein	HIM	S	ZW 8-3
Do	9	15:00	Ladriere	GR	Grebe	V
Do	10	15:50	ZS 6-1	V	NGN	V
Do	11	16:45	Ladriere	S	ZO 8-6	Ü
Do	12	17:35	GR	S	Krug	MA2
Do	13	18:30	ZS 6-1	S	ZW 7-2	TUT
Do	14	19:20				

Friday

Fr	1	8:00				
Fr	2	8:50				
Fr	3	9:45	Pörschmann	V		
Fr	4	10:35	VAE	V		
Fr	5	11:30	ZW 8-3	Ü		
Fr	6	12:20	Dettmar	V		
Fr	7	13:15	ACC	V		
Fr	8	14:05	ZW 6-1	Ü		
Fr	9	15:00			Erkan	PM
Fr	10	15:50			ZO 6-8	V
Fr	11	16:45			Erkan	PM
Fr	12	17:35			ZO 6-8	V

Further information about the lecture time schedule:

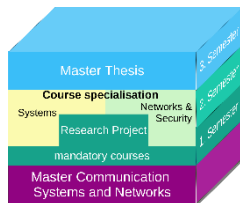
https://ilias.th-koeln.de/ilias.php?ref_id=911112&cmd=render&cmdClass=ilrepositorygui&cmdNode=wc&baseClass=ilRepositoryGUI

Information about courses in Summer Term

Please look up/find the courses under the name of the professors in ILIAS (**registration required!**)

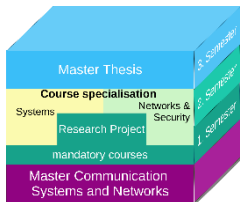
https://ilias.th-koeln.de/goto.php?target=cat_62623&client_id=ILIAS_FH_Koeln

- BSN (**Profs. Dettmar** / Elders-Boll /Kronberger)
Tue, 21. March, 09.45
- HIM Advanced Mathematics (**Prof. Rhein**)
English language only summer term!
First lecture, Thur., March 23, 11.30
- NGN Next Generation Networks (**Prof. Grebe**)
First lecture, Thur., March 23, 13.15, 15.00



Information about courses at TH-K (summer term)

- KRY Cryptography ([Prof. Knospe](#))
First lecture: Monday., March 20, 13.15,
(**mandatory course for IT-Security** in winter term!)
- VAE Virtual Acoustic Environments ([Prof. Pörschmann](#))
First lecture, Friday, 24. March, 09.45
- ACC Advanced Channel Coding ([Prof. Dettmar](#))
First lecture, Friday, 24. March, 12.20
- RFSD Radio Frequency System Design ([Prof. Kronberger](#))
First lecture, Wednesday 22 March, 11.30
- PM Project Management (English, Dr. Erkan)
(register course in [Prof. Dettmar](#))
First lecture, Friday 24 March 16.30
Attention: You have to register in ULP – PSSO



Information about courses at HS-BRS

Timetable of Semester Master CSN 2

Semester: Sommersemester 2023, **Calendar Weeks:** 13-26, **Weekdays:** Monday-Sunday, **As of:** 2023-03-17 16:37:23

The table does not show events that lie in the past.

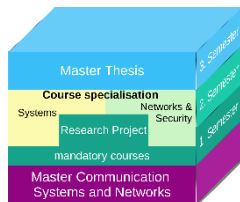
	from	until	Room	Activity	Period	Who
Tu	9:00	10:30	St-C181	(IS) Identification- and Privacy-Enhanced-Technologies (PETs) (V)	28.03.2023-27.06.2023 (KW 13-26)	Ullmann
	10:45	12:15	St-C181	(IS) Identification- and Privacy-Enhanced-Technologies (PETs) (Ü)	28.03.2023-27.06.2023 (KW 13-26)	Ullmann
	13:30	15:00	St-B060	(TK) Kommunikation in verteilten Systemen (Raum K302) (V)	28.03.2023-27.06.2023 (KW 13-26)	Rademacher
	13:30	15:00	St-B062	(IS) Embedded Security (V)	28.03.2023-27.06.2023 (KW 13-26)	Lemke-Rust
	15:15	16:45	St-B060	(TK) Kommunikation in verteilten Systemen (Raum K302) (Ü/P)	28.03.2023-27.06.2023 (KW 13-26)	Rademacher
	15:15	16:45	St-B062	(IS) Embedded Security (Ü)	28.03.2023-27.06.2023 (KW 13-26)	Lemke-Rust
We	13:30	15:00	St-C018	(IS) Fortgeschrittene Managementkonzepte der Informationssicherheit (V)	29.03.2023-28.06.2023 (KW 13-26)	Haferkorn
	15:15	16:45	St-C018	(IS) Fortgeschrittene Managementkonzepte der Informationssicherheit (Ü)	29.03.2023-28.06.2023 (KW 13-26)	Haferkorn
Th	9:00	10:30	St-C130	(TK) Optische und drahtlose Übertragungsnetze (V)	30.03.2023-29.06.2023 (KW 13-26)	Uhde
	10:45	12:15	St-C130	(TK) Optische und drahtlose Übertragungsnetze (Ü)	30.03.2023-29.06.2023 (KW 13-26)	Uhde
Fr	9:00	10:30	St-C018	(IS) Malware Analyse (V)	31.03.2023-30.06.2023 (KW 13-26)	Padilla
	10:45	12:15	St-C018	(IS) Malware Analyse (Ü)	31.03.2023-30.06.2023 (KW 13-26)	Padilla

(KW = Kalenderwoche, gKW = even calendar weeks, uKW = odd calendar weeks)

Further information about the lecture time schedule:

HS Bonn-Rhein-Sieg (FB Informatik) [https://eva2.inf.h-](https://eva2.inf.h-brs.de/stundenplan/anzeigen/?weeks=13%3B14%3B15%3B16%3B17%3B18%3B19%3B20%3B21%3B22%3B23%3B24%3B25%3B26&days=1-7&mode=table&identifier_semester=%23SPLUS4222DA&show_semester=&identifier_dozent=&identifier_raum=&term=d05c4b8124781b3c23c490afc2fa6f7b)

[brs.de/stundenplan/anzeigen/?weeks=13%3B14%3B15%3B16%3B17%3B18%3B19%3B20%3B21%3B22%3B23%3B24%3B25%3B26&days=1-7&mode=table&identifier_semester=%23SPLUS4222DA&show_semester=&identifier_dozent=&identifier_raum=&term=d05c4b8124781b3c23c490afc2fa6f7b](https://eva2.inf.h-brs.de/stundenplan/anzeigen/?weeks=13%3B14%3B15%3B16%3B17%3B18%3B19%3B20%3B21%3B22%3B23%3B24%3B25%3B26&days=1-7&mode=table&identifier_semester=%23SPLUS4222DA&show_semester=&identifier_dozent=&identifier_raum=&term=d05c4b8124781b3c23c490afc2fa6f7b)



For course registration: <http://register.inf.h-brs.de/>

 **mandatory!**

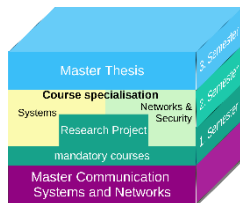
Communication Systems and Networks

R. Kronberger 10/2022

Double Degree Program with Polytechnical University of Valencia, Spain

Polytechnical University Valencia (UPV) and TH Cologne (THK) promote the exchange of students in degree courses of “*Master of Science in Communication Systems and Networks*” and “*Máster Universitario en Tecnologías, Sistemas y Redes de Comunicaciones*” (“Master in Telecommunication Technologies, Systems and Networks”) to obtain a **Double Degree**.

- Students have to acquire 90 ECTS credits in total during their studies at both Universities in the respective Master programs.
- Courses during one or two semester in Köln and one semester in Valencia and afterwards final thesis in Köln or Valencia.

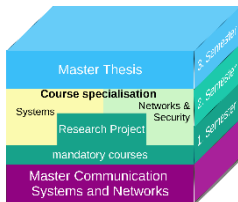
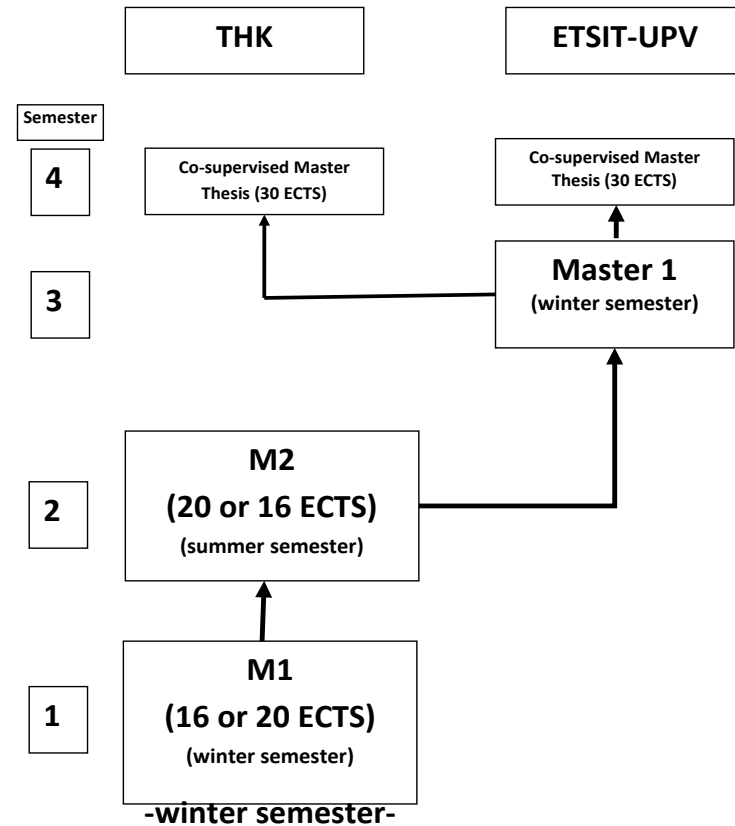
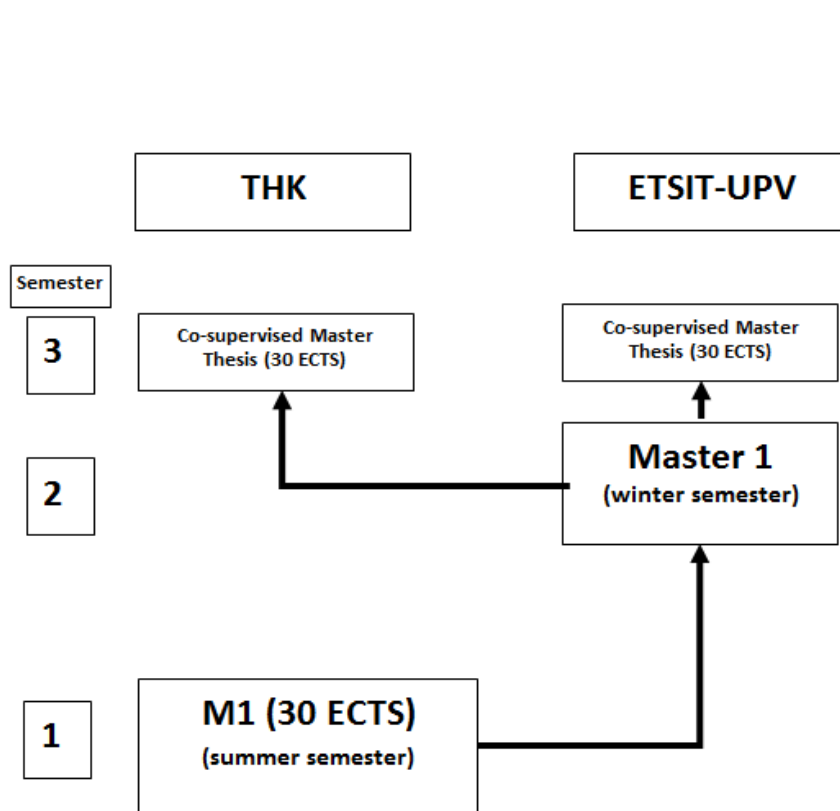


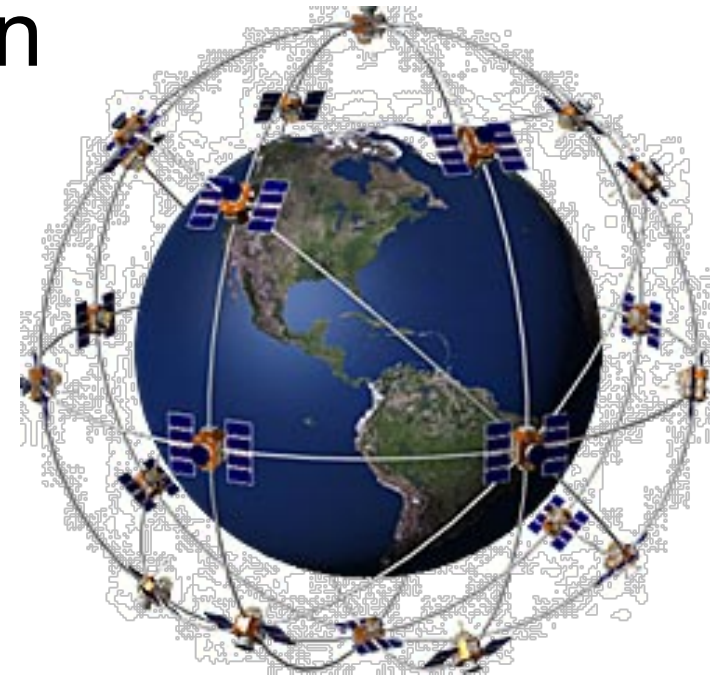
Double degree

■ Student from Cologne outgoing to Valencia

ITINERARY 2: THK to ETSIT-UPV

[Each box represents 30 ECTS credits]





Room-Name

Building, Direction (**N, O, S, W**) ,level, Room -Nr.

for example ZW 7 – 2 is in the main building, Westwing, 7. floor, room 2)

Important rooms

2. Floor

Entrance, Offices for Examination/ Application

Main Lecture Room AM (Audimax), Lecture rooms 7 - 14

Student Council (AstA) and Mensa

6. Floor

ZO 6 – 5 = Student council Communications Engineering

ZN 6 – 18 = Secretary / Dean

ZO 6 – 6, ZO 6 – 10, ZW 6 – 1, ZS 6 –1 Lecture rooms

7. Floor

ZW 7 – 2 = Lecture room

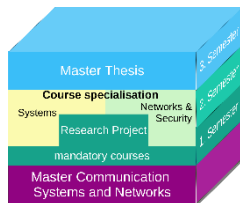
8. Floor

North : Laboratories for Telecommunication (Prof. Dettmar, Prof Elders-Boll)

East: Network Lab (Prof. Grebe)

West: Acoustic Lab (Prof. Pörschmann), HighFrequency Lab (Prof. Kronberger)

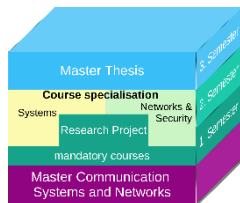
ZW 8-3 u. ZO 8-6: Lecture Rooms



Important Information about Research Project

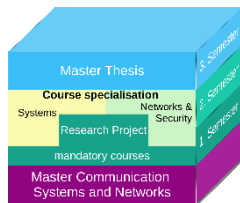
Fakultät 07 Informations-, Medien- und Elektrotechnik

Prof. Rainer Kronberger



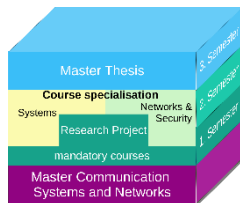
Important Facts

- **10 ECTS / 300h workload**
- **1st and/or 2nd semester**
- **Theoretical and/or practical work**
- **Will be supervised by participating professors**
- **Can also be done in industry, but **only with permission and involvement of a professor !****



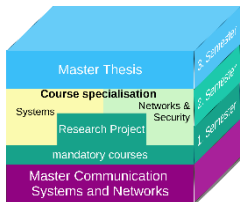
What is a Research Project?

- **Research projects are offered by participating professors each semester .**
 - **The student is fully responsible by himself to look for a research project!**
 - **The topic of the project should be in the personal area of interests of the student!**
 - **The student may offer the professor own topics or wishes (in the field of research of the professor / laboratory)**
- **Within the project, the student shall**
 - work individually on a research topic
 - analyze a problem in a scientific way
 - find new or suitable solutions to solve the problem
 - plan the project in a scientific way
 - do experiments, simulations and/or theoretical work
 - evaluate the results
 - present the results and write a report



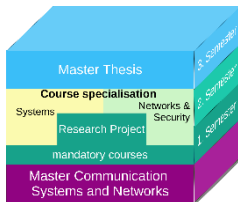
Time, work schedule and evaluation(1)

- Research project can be started either in SS or in WS
- 10 ECTS → 300h workload → 2 x 15 weeks = ca. 9 - 10h/week over 6 months or as common block
- research project starts with introduction phase (4 – 6 weeks)
 - student chooses the topic of the research project
 - student gets familiar with the problem
 - student works theoretically to understand the problem
- student gives a presentation about the topic, the problem and shows first ideas and solutions (after 1 - 2 months)
 - will be presented together with other students
 - student gives a short summary (2 pages)
 - presentation and summary will be evaluated (25%)
- **When you have started your RP, you have maximum 12 months to finish!**
Hard deadline! Otherwise you will fail!



Time and work schedule and evaluation(2)

- **main research work continues**
 - lab work (6 - 8h / week = 1 full day or 2 x half days /week !)
- **work can be done either during the semesters only but also during the semester break in one block (e.g. totally 7 - 8 weeks fulltime)**
- **final presentation at the end of the project**
 - will be presented together with other students
 - student gives a project report (max. 10 pages)
 - presentation and report will be evaluated by the professor(s)
- **total grading:**
 - 25% from first presentation
 - 40% overall performance of research work
 - 25% final presentation
 - 10% final report

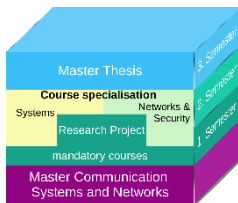


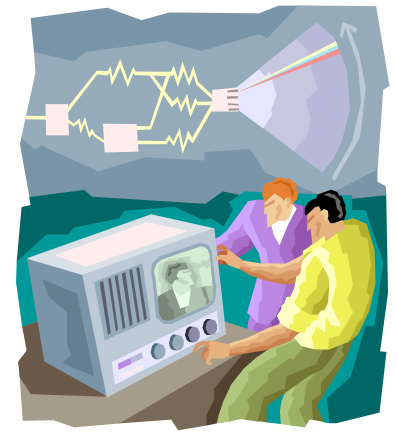
Course Registration - Exam Registration

- You will get an additional and detailed Information from the examination office about the **PSSO Examination Registration Software**.

Some important hints, for now:

- Register in ILIAS courses (find course under Prof. name)
- Register in the PSSO for the ULP ! **DO NOT MISS!**
If course has a **ULP**, this is **mandatory**! Otherwise you cannot register for the course exam! Registration for ULP **afterwards not possible!**
- Register in the PSSO until given deadline for the course exam!
Exam withdrawal possible until one week before exam!





Find further information under

<http://www.mcsn.de/>

or

TH-Köln: Prof Rainer Kronberger, Room ZW 8-14

Office hours: by request per mail

HS Bonn-Rhein Sieg: Prof.

