



Modules MSc Communications and Electronics Engineering (MSCE) PO2023 (start WS23/24)

Module ID	Module	Lecturer	Semester	ECTS	Focus on
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Core Modules Communications Systems (CS): at least 10 Credits

EI70330	Data Networking	Kellerer	WS	5	
EI70320	Channel Coding	Wachter-Zeh	WS/SS	5	
EI70350	Information Theory	Kramer	WS	5	
EI70240	Statistical Signal Processing	Utschick	SS	5	
EI7432	System Aspects in Communications	Viering	WS	5	

Core Modules Communication Electronics (CE): at least 10 Credits

CIT44300 15	Analog and Mixed-Signal Circuit Design	Brederlow	WS	5	
EI70610	Electronic Design Automation	Schlichtmann	SS	5	
EI70530	Embedded Systems and Security	Sigl	WS/SS (German in SS)	5	
EI7355	Nanosystems	Becherer	WS/SS	5	
EI7384	System-on-Chip Technologies	Herkersdorf	WS	5	

Elective Modules Advanced Topics: at least 5 Credits

EI79001	Advanced Topics in Communications Systems	Guest Professor	SS	5	CS
EI79002	Advanced Topics in Communications Electronics	Guest Professor	SS	5	CE

Electives: 28 Credits

Fewer electives, if you have passed more core modules or elective modules advanced topics, in total 53 credits:

CIT43300 08 ¹	5G New Radio Communications: Physical Layer Channels and Procedures	Boche	WS/SS	5	CS
EI7433	Adaptive and Array Signal Processing	Ivrlac	WS	5	CS
IN2097	Advanced Computer Networking	Carle	WS	5	CE
EI71070	Advanced Cryptographic Implementations	De Santis	SS	5	CS
EI71105 ²	Advanced Topics in IoT Security	Steinhorst	SS	5	CE
EI7523	Analog Bipolar Electronics: Devices, Simulation and Circuits	Brederlow	SS	3	CE
EI7450	Analysis, Modelling and Simulation of Communication Networks	Kellerer	SS	6	CS
EI73081	Antennas and Wave Propagation	Eibert	SS	5	CS

¹ wird im Wintersemester 2024-25 nicht angeboten/ will not be offered in winter semester 2024-25

² wird in WiSe24-25 angeboten/ will be offered in winter semester 2024-25

Module ID	Module	Lecturer	Semester	ECTS	Focus on
CIT4430010	Antennas for Space and Aeronautics Applications	Eibert	WS	5	CS
EI71086	Applied Machine Intelligence	Diepold	SS	9	CS
CIT4330010	Brain, Mind and Cognition	Diepold	WS/SS	6	CS
EI7411	Channel Codes for Iterative Decoding	Liva	SS	5	CS
EI7271	Chip Multicore Processors	Herkersdorf	SS	6	CS/CE
EI70520	Circuit Design for Security	Sigl	SS	5	CE
CIT433023	Circuit Reliability for AI in Advanced Technologies	Amrouch	SS	6	
EI7440	Circuit Theory and Communications	Ivrlac	WS	5	CS/CE
EI71108	CMOS Analog-to-Digital Converters	Brederlow	SS	5	CE
EI74121	Coded Modulation	Bartz/Matuz	SS	5	CS
CIT4330015 ³	Coding for Private Reliable and Efficient Distributed Learning	Wachter-Zeh	WS	5	CS
EI71087	Coding Theory for Storage and Networks	Wachter-Zeh	SS	5	CS
EI71004	Communication Acoustics	Seeber	WS	6	CS
EI7644	Communication Network Reliability	Mas Machuca	SS	5	CS
CIT4330006	Communication Networks, Modeling and Optimization	Kellerer	SS	5	CS
EI73181 ⁴	Computational and Analytical Methods in Electromagnetics	Eibert	WS	6	CS/CE
EI74351	Convex Optimization	Utschick	WS	6	CS
EI71067	Digital Signal Processing for Optical Communication Systems	Fehenberger	SS	5	CS
EI71104	Embedded System Design for Machine Learning	Schlichtmann	WS	6	CE
CIT433021	Fundamentals of Foundation Models	Heckel	SS	5	CS
EI70410	High-Frequency Amplifiers and Oscillators	Eibert	SS	5	CE
EI70630	HW/SW Codesign	Herkersdorf	WS/SS	5	CE
EI7341	Image and Video Compression	Steinbach	SS	5	CS
CIT4330016	Innovative Computing for AI	Amrouch	WS	6	
CIT4430002	Integrated Circuits for Radio Applications	Hagelauer	WS	5	CE
EI71083	Intelligent Machine Design - Mechatronics Fundamentals	Haddadin	SS	6	CE/CS
EI71064	Introduction to Quantum Networks	Nötzel	WS/SS	5	CS
CIT433022	Introduction to Quantum Optics and Applications	Boche	WS/SS	5	CS
CIT4430009	Inverse Problems in Electromagnetic Imaging	Eibert	SS	5	CS

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Module ID	Module	Lecturer	Semester	ECTS	Focus on
CIT43300 09 ⁵	IoT Security	Steinhorst	WS/SS	5	CE
EI70360	Machine Learning and Optimization	Heckel	WS	5	CS
EI71018	Machine Learning for Communications	Kramer	WS	5	CS
CIT43303 1	Machine Learning for Electronic Design Automation and Manufacturing	Wille	WS/SS	5	CE
EI71059 ⁶	Mixed Integer Programming and Graph Algorithms for Engineering Problems	Schlichtmann	WS	5	CE
EI7436	MIMO Systems	Joham	WS	6	CS
EI71095	Multi-Criteria Optimization and Decision Analysis for Embedded Systems Design	Herkersdorf	WS	5	CE
EI70220	Digital Signal Processing	Steinbach	WS/SS	5	CS
EI7352	Multimedia Communications	Steinbach	SS	5	CS
EI7353	Multi-User Information Theory	Kramer	SS	5	CS
EI7356	Network Planning	Schupke	WS	5	CS
EI7494	Numerical Linear Algebra for Signal Processing	Utschick	SS	6	CS
EI5075	Optical Communication Systems	Hanik	WS	6	CS
EI7633	Optical Networks	Mas Machuca	WS	5	CS
EI70730	Memory Technology for Data Storage	Kreupl	WS/SS	5	CE
CIT44301 8	Phase Locked Loop / Clocked Circuits	Brederlow	WS	5	CE
EI7485	Physical Principles of Electromagnetic Fields and Antenna Systems	Ivrlac	SS	6	CS
EI71029	Physical Unclonable Functions	Sigl	WS	5	CE
EI71103	Post Shannon Theory	Boche	SS/WS	5	CS
EI71073	Quantum Computers and Quantum Secure Communications	Sepulveda	SS	5	CE
EI76471	Quantum Information Theory	Boche	WS/SS	5	CS
EI71093	Quantum Optomechanics	Weig	SS	5	CE
EI73761	Radar Signals and Systems	Siart	WS	5	CS
EI0432	Satellite Navigation	Günther	WS	6	CS
EI71060	Security in Communications and Storage	Wachter-Zeh	WS	5	CS
EI70380	Signal Processing and Machine Learning	Utschick	SS	5	CS
EI71036	Software Architecture for Distributed Embedded Systems	Steinhorst	WS	5	CE/CS
EI71068	Solving Inverse Problems with Deep Learning	Heckel	SS	6	CS
EI70640	Synthesis of Digital Systems	Schlichtmann	WS/SS	5	CE
CIT44300 01	System Design for High-Frequency and High-Datarate Applications	Hagelauer	WS	5	CE
EI71013	System Design for the Internet of Things	Steinhorst	SS	5	CE
EI7624 ⁷	Techno-Economic Analysis of Telecommunication Networks	Mas Machuca	WS	5	CS

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Module ID	Module	Lecturer	Semester	ECTS	Focus on
EI50141	Testing Digital Circuits	Otterstedt	WS	5	CE
EI5052	Time-Varying Systems and Computations	Diepold	WS	6	CE
EI70550	Timing of Digital Circuits	Li	WS	5	CE
EI71075	Wireless Communications	Kramer	WS	5	CS

Laboratories: 12 Credits

CIT43100 06	6G Business Modeling and Prototyping	Kellerer	WS/SS	9	CE/CS
CIT43100 08	Brain-inspired Computing for AI	Amrouch	WS/SS	6	
EI5032	Communications Lab	Kramer	WS	6	CS
EI72071	Computational Haptics Laboratory	Steinbach	SS	6	CS
EI72561	Convex Optimization Laboratory	Utschick	SS	6	CS
EI50881	High-Frequency Circuit Laboratory	Eibert	WS/SS	6	CE
EI50291	Image and Video Compression Lab	Steinbach	WS/SS	6	CS
EI78049	IoT Remote Lab	Steinhorst	WS/SS	6	CE
EI78060	Lab CMOS A/D Converter Design	Brederlow	WS	6	CE
CIT44101 6	Lab CMOS PLL Circuit and System Design	Brederlow	SS	6	CE
EI78064	Lab CMOS Voltage Regulation Circuit Design	Brederlow	SS	6	CE
CIT44100 13	Laboratory Design of Integrated Analog and Mixed-Signal Circuits	Hagelauer	SS	6	CE
CIT44100 11	Lab Integrated Circuits for Radio Applications	Hagelauer	SS	6	CE
CIT44100 12	Laboratory on System Design for High-frequency and High-datarate Applications	Hagelauer	SS	6	CE
CIT43101 1	Practical Course Atomistic Simulation of Nano-materials and Electronic Devices	Vogl	WS/SS	5	CE
CIT43100 01	Praktikum ASIC Design von Hardwarebeschleunigern für RISC-V	Sigl	WS/SS	6	CE
CIT43100 03	Programmable Communication Networks Lab	Kellerer	WS/SS	6	CS
EI5042 ⁸	Project Lab IC Design	Herkersdorf	WS/SS	6	CE
EI78033 ⁹	Projektpraktikum Audio-Signalverarbeitung	Seeber	WS/SS	6	CE
EI78075	Projektpraktikum Human Activity Understanding	Steinbach	WS/SS	6	CS
EI78071	Projektpraktikum Nanomagnetische Bauelemente	Becherer	WS/SS	6	CE
EI5028	Satellite Navigation Lab	Günther	SS	6	CS
EI7493	Signal Processing for Audio Technology	Seeber	SS	8	CS
EI5030	Simulation of Optical Communication Systems Lab	Hanik	WS/SS	6	CS
EI5069	Smart Card Lab	Sigl	WS/SS	6	CS/CE

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Module ID	Module	Lecturer	Semester	ECTS	Focus on
EI78045 ¹⁰	Software Defined Radio Laboratory	Boche	WS/SS	6	CS
EI7402	SystemC Lab	Herkersdorf	WS/SS	6	CE
EI7403	VHDL System Design Lab	Schlichtmann	WS/SS	6	CE
CIT43100 ⁹	Wireless Communications Laboratory	Kramer	SS	6	CS
EI50471	Wireless Sensor Networks Laboratory	Kellerer	WS/SS	6	CS

The labs count towards the final grade point average with their corresponding credit weight. For all labs at the department, there is always a special registration deadline.

Registration information for labs and details about introductory meetings are made available on the websites of the various chairs shortly before the beginning of each semester. So please check these websites.

Seminars: 5 Credits

CIT4320002	Seminar AI für Processor Design	Amrouch	WS/SS	5	
EI77001	Seminar Embedded Systems and Internet of Things	Steinhorst	WS/SS	5	CS
EI77009	Seminar Machine Learning	Heckel	WS/SS	5	CS
EI77692 ¹¹	Seminar Micro- and Nanosystems Technology	Hagelauer	SS	5	CE
CIT442002	Seminar Nanomechanical Sensors and Applications	Weig	WS/SS	5	CE
EI77015	Seminar on Coding and Cryptography	Wachter-Zeh	WS/SS	5	CS
EI77013	Seminar on Digital Communications	Kramer	WS/SS	5	CS
EI77014	Seminar on Optical Communications	Hanik	WS/SS	5	CS
CIT432005	Seminar Quantum Information Processing Devices	Vogl	WS/SS	5	CE/CS
CIT4320003	Seminar Quantum Networks	Vogl	WS/SS	5	CE/CS
EI5092	Seminar on Security in Information Technology	Sigl	WS	5	CS/CE
EI7778	International Seminar Signal Processing	Utschick	SS	5	CS
EI5090 ¹²	Seminar on Signal Processing in Communications	Utschick	WS	5	CS
EI5091	Seminar on Topics in Antennas and Propagation	Eibert	WS	5	CS/CE
EI5087	Seminar on Topics in Communications Networking	Kellerer	WS	5	CS

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EI77502	Seminar on Topics in Electronic Design Automation	Schlichtmann	WS	5	CE
EI77501	Seminar on Topics in Integrated Systems	Herkersdorf	WS	5	CE
EI77503	Scientific seminar on structure, architecture and application of sensor circuits	Brederlow	WS/SS	5	CE
EI5084	Seminar on Topics in Signal Processing	Steinbach	WS	5	CS

Interdisciplinary Courses: 8 Credits

Recommended:

	German Language Course	TUM Language Center	WS/SS	6	
EI04004	Strategic Management for Engineers	Sauerbrey	WS	3	

As interdisciplinary course, any TUM course on a topic different from electrical and computer engineering (no Elxx module number) and other universities can be taken. The courses can only be counted, if there is a confirmation of the course including the number of credits. Any language course (excepting English), offered by e.g. the TUM language center, can be counted as an interdisciplinary course. If you want to be sure, if your course will be counted, please contact the program manager. The grades of the interdisciplinary modules will not count toward your final grade.

Research Internship: 12 Credits

Duration and Timing

The research internship (in German so called Forschungspraxis) is a career-related, full-time (approx. 35-40 hours per week, depending on the company) professional experience at the university or in industry with a minimum length of 9 weeks. If required by industry, we can certify that 9 weeks are required as a mandatory research internship for your studies. Usually it is scheduled immediately after the second semester until the beginning of the third semester. Please consider the following suggested timeline:

March	Start looking for research internship placement
End of July	Final Exams for semester 2
August through mid-October	Research Internship
Mid-October	Semester 3 begins
End of October	Hand in the required paperwork

Research Internship Arrangement & Registration

How to get an internship

Students must arrange for an internship themselves. The following guidelines have to be followed: In case you need a confirmation that a research internship is required by your curriculum, please contact us: msce@ei.tum.de

To find a research internship project, please contact the chairs directly. Some chairs list available projects on their website. If you want to do the research internship in industry, you have to find a professor at TUM who will supervise it. Please find a professor before signing any industry contract to avoid any inconvenience. Once you have found a research internship position, please report it to the program manager. You must write a technical report about your internship (approx. 1-2 pages per week). At the end of the research internship, you will present your results to the professor, followed by a short discussion.

Technical Report

At the end of your research internship, you must write a technical report that documents the work and presents the results. A good structure for an internship report is: cover and title page; abstracts; table of contents; introduction; problem definition; theory; implementation; testing for correctness of results, performance, usability, assessment; conclusions and ideas for future work; and references.

The total length of the report should be at least 1-2 pages per week.

You should also include one page of critical analysis (not simply a description) of the experience in terms of learning objectives and overall experience at the time of completion of the internship.