Technology Arts Sciences
TH Köln

Course Manual FIT

Wireless Communications in the IoT

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— General information

Long name	Wireless Communications in the IoT
Approving CModule	FIT_BaET, FIT_BaTIN
Responsible	Prof. Dr. Uwe Dettmar Professor Fakultät IME
Valid from	winter semester 2022/23
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Uwe Dettmar Professor Fakultät IME
Requirements	Students should bring basic knowledge in digital communications, signal theory, and networks and protocols. They should further have basic skills from linear algebra and statistics. Basic programming capabilities are required, too.
Language	German, English if necessary

Literature

DAHLMAN, E. ; PARKVALL, S. ; SKÖLD, J. : 5G NR : the next generation wireless access technology. 1st. Elsevier Science, 2018

FINKENZELLER, K. : RFID Handbuch. Hanser, 2008.

FÖRSTER, A. : Introduction to Wireless Sensor Networks. Wiley-IEEE Press, 2016.

GEIER, J. : Designing and deploying 802.11 wireless networks, Cisco Press, 2015.

LIAO, R. ; BELLALTA, B. ; OLIVER, M. ; NIU, Z. : MU-MIMO MAC Protocols for Wireless Local Area Networks: A Survey. In: IEEE Commun. Surv. Tutorials 18 (2016)

Mobile positioning and tracking : from conventional to cooperative techniques. Wiley-IEEE Press

TANENBAUM, A. S. ; WETHERALL, D. : Computer networks. Pearson Education, 2014

Final exam

Separate final exam	Yes

Details

- Form: oral examination, optional: written test
- Duration: 30 minutes
- Assignment: topics and questions from the different parts of the course are answered or discussed by the students, respectively. Short calculations are performed or sketeched.
- Different taxonomies are rated according to their complexity and difficulty.
- observable results from project or seminar work, respectively, can be included into the total score with up to 30 %.

Minimum standard

Basic knowledge can be adequately applied to known and related problems. The execution is in parts faulty. (4,0)

Exam Type

EN mündliche Prüfung, strukturierte Befragung

Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	The underlying concept of this module is a combination of lecture and tutorial. After a lecture block of approximately 20 minutes the subjects taught are actively trained using Matlab/Octave and Python programs. Syllabus: - Introduction, What is IoT/Industy 4.0? - Overview: Markets and application areas for wireless communikations - Standards, Basics on wireless communications - sensor, actor and uC - Muiltiple Access and data link Control in Sensor Networks - Techniques for higher rates - Network, Fog and Cloud Computing - Standards for cellular (4G, 5G), WLAN, LPWAN, WNAN and WPAN Students shall deepen their knowledge by self-study of literature and internet ressources and discuss their results in small learning groups as teamwork.
Skills	By combination of taught subjects and small exercises and programs during the presence time, students are able to actively train their knowledge. More extensive problems are solved and discussed in the second part of the course to activate the student's capabilities to solve relevant problems. Students further learn - to analyze communication systems and to estimate their performance - to select appropriate standards for specific applications - to apply their knowledge to technical problems

Special requirements

Accompanying material	lecture slides, problems and solutions, course page in the Ilias learning platform, collection of links, Matlab and Python programs
Separate exam	No

Expenditure classroom teaching

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

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

─ Lecture / Exercises

Learning goals

Goal type	Description
Skills	Students plan and work on projects in the field of the IoT in small teams. They use HW and SW to implement or evaluate wireless standards and to acquire, transfer, collect, present, and evaluate data, e.g., generated by sensors. The projects of different teams may be combined to a bigger project. The results are presented at the end of the project and may be assessed and included into the total score by up to 30%.

Expenditure classroom teaching

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

Special requirements

Accompanying material	Problem formulation Introductory presentation
Separate exam	Yes

Separate exam

Exam Type	EN Projektaufgabe im Team bearbeiten (z.B. im Praktikum)
Details	Presentation of the results, discussion with course attendees and the Professor. Observable parts of the project work are assessed.
Minimum standard	Project plan presented and discussed. Project implementaion and presentation sufficient but incomplete or faulty. (4,0)

Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	Alternatively: Seminar work with a hot topic from the course content. Written report will be rated. Self conducted literature research, analysis of the sources, adequate and understandable presentation of the main aspects, discussion and assessment of the findings.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Seminar	0
Tutorial (voluntary)	0

Special requirements

Accompanying material	undefined
Separate exam	Yes

Separate exam

Exam Type	EN Fachgespräch (Interview) zu besonderen Fragestellungen (Szenario, Projektaufgabe, Lieraturrecherche)
Details	Assessment of the written report. May be included by up to 30 % into the total score
Minimum standard	Report includes the most essential aspects, presentation parly faulty or incomplete. (4,0)

− Practical training

Learning goals

Goal type	Description
Skills	Atlernatively: lab work related to single aspects of the lecture to deepen the understanding. This may include HW and SW problems.

Expenditure classroom teaching

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

Special requirements

Accompanying material	lab manuals
Separate exam	No