

IoT and Digitalization for the Circular Economy

Lecture 0: Organization

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- Updated versions of these slides will be available in our <u>Github repository</u>.



Institute for Software and Systems Engineering

Team



Prof. Dr. Benjamin Leiding

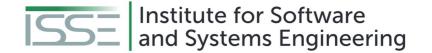


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M.Sc. Shohreh Kia

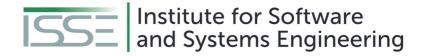




Research Group

- Emerging Technologies for the Circular Economy → ETCE
- Research focus:
 - Intersection of IT and sustainability
 - Circular Economy and Circular Societies
 - Self-organized, decentralized and distributed systems
 - Sustinable and resilient food production
- Other courses:
 - Requirements Engineering (WS M.Sc.)
 - The Limits to Growth Sustainability and the Circular Economy (WS open for everyone)





Research Group

- ETCE Website Link
 - Course material
 - Theses/project topics
- Our research in action:
 - ZDF documentary (German) <u>Link</u>
 - Klartext Preis 2020 (German) <u>Link</u>



Learning Outcome

- Understanding the concept of a circular economy, sustainability, and related concepts (biocapacity, etc.).
- Gain a basic understanding of causes, dimensions, and the characterization of climate change, environmental pollution, and dwindling non-renewable resources.
- Introduction to IoT and cyberphysical systems in the circular economy
- Sensors and actuators for IoT, control and process systems of the circular economy
- Experience in prototyping IoT applications and systems
- The ability to critically assess upcoming technological solutions enabling/facilitating sustainability and the circular economy.

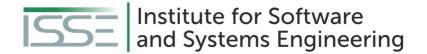




Lectures

- 15.04.2024 → Organization (L00) + Introduction (L01)
- 22.04.2024 → Circular Economy (L02)
- 29.04.2024 → Lifecycle Assessment LCA (L03)
- 06.05.2024 → Introduction to the Internet of Things (L04)
- 13.05.2024 → Internet of Things Communication + Security and Privacy (L05)
- 27.05.2024 → Internet of Things Data Processing and BigData (L06)
- 03.06.2024 → Industrial Internet of Things (L07)
- **1**0.06.2024 → IoT in Mining I (L08)
- **17.06.2024** → **IoT** in Mining II (L09)
- 24.06.2024 → Technologies for Sustainability MOOC Content (L10)
- 01.07.2024 → Coding Workshop I (Goslar)
- **•** 08.07.2024 → Coding Workshop II (Goslar)
- **15.07.2024** → Exam Q&A





Exercises

- 15.04.2024 → Exercise 01 Carbon Footprint
- 22.04.2024 → Exercise 02 Circular Economy
- 29.04.2024 → Exercise 03 LCA
- 03.06.2024 → Exercise 04 Industrial IoT
- 17.06.2024 → Exercise 05 IoT in Mining
- 24.06.2024 → Exercise 06 Technology Assessment





Course Organization

- News and updates → StudIP
- Organization of the lecture:
 - Slides are available on Github (<u>Link</u>)
 - Please report bugs!
 - Lectures and exercises as live stream (BBB next slide)
 - Lecture recordings will be available on StudIP and on Github
 - Exercise time slots = Time for questions and eventual tutorials related to the exercises

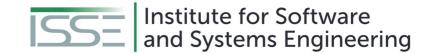
Questions? Write us an email: etce-iot@tu-clausthal.de ← We will only respond to emails written to this specific email address!



Dates/Times/Locations

- Lecture:
 - Monday 2:15 pm to 3:45 pm (Berlin time) 15.04.2024 to 04.07.2024
 - Location: Goslar Gotec (Am Stollen 19 C, 38640 Goslar, Germany) or via BigBlueButton
 (Link) OR video recordings
- Exercise / Q&A:
 - Monday 4 pm to 5 pm (Berlin time) 15.04.2024 to 24.06.2024
 - Location: Goslar Gotec (Am Stollen 19 C, 38640 Goslar, Germany) or via BigBlueButton (Link)
- Practical Coding Workshop:
 - When: 02.07.2024 and 04.07.2024 from 9 am 4 pm (Berlin time)
 - Location: Goslar (DIGIT)





Exercises and Practical Workshop

- Individual work → no group submissions
- Submission of each exercise is mandatory
- You pass by submitting an exercise even if it is an empty page
- You will receive feedback on your submission (during Q&A session)
- Exercise = learning feedback
- Practical workshop → You pass the workshop if you score 50% (or more)



Examination

- Prerequisite for admission to the final exam (all criteria have to be fulfilled):
 - Submit all exercises
 - Pass the practical workshop
- Final exam:
 - Most likely 25.07.2024 and 26.07.2024
 - Oral examination (20min)
 - Online





Self-Study Star

 Slides with the self-study star indicate optional/additional study material that is not mandatory but could be helpful or interesting



Literature

- This course is not based on a single book and you do not need to buy a book to pass the exam.
- Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows. The Limits to Growth (1972).
- Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows. Limits To Growth: The 30-Year Update (2004).
- Baccini et al. Metabolism of the Anthroposphere: Analysis, Evaluation, Design (2012).
- Walter R. Stahel. The Circular Economy: A User's Guide (2019).
- W. Brian Arthur. The Nature of Technology: What It Is and How it Evolves (2011)

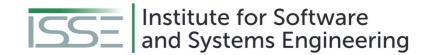




Literature

- Perry Lea. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security (2018).
- M.A. Khan, M.T. Quasim, F. Algarni, A. Alharthi. Decentralised Internet of Things (2020).
- Dimitrios Serpanos und Marilyn Claire Wolf. Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies (2018).





Questions?