



Ruhr Master School
of Applied Sciences

Dieses Wahlpflichtmodul ist ein Angebot der:

**Fachhochschule
Dortmund**

University of Applied Sciences and Arts

Master Digital Transformation

Software-intensive Solutions

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Hochschule Bochum
Bochum University
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**Fachhochschule
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University of Applied Sciences and Arts



**Westfälische
Hochschule**
Gelsenkirchen Bocholt Recklinghausen
University of Applied Sciences

**STIFTUNG
MERCATOR**



Software-intensive Solutions (MOD2-02)					
Code Number	Workload	Credits	Semester	Frequency	Duration
48070/71	180 h	6	2	summer semester	1 Semester
1	Course Title Software-intensive Solutions	Contact hours 4 SWS / 60 h	Self-Study 120 h	Planned Group Size 25 students	
2	Course Description This course has the aim to walk through the technology stack of an Internet of Everything (IoE) solution. Students will get a holistic view on the processes, components, methods and tools and their connections and dependencies. Relevant architectures and concepts are put into the context of complete IoE solutions. This holistic view starts with the level of the devices that are connected to the internet like mobile devices or sensors and actuators. Realizing such systems commonly requires the communication with sensors and actuators on the hardware-side and communication with cloud services on the software-side. The corresponding cloud service has to process and store data like sensor values and analyze these with artificial intelligence or machine learning, which must be taken into account while developing such systems. The course intends to put the topics addressed by the first semester modules into the overall context. This forms (as a connecting element) the bridge to the more specific elective modules.				
3	Course Structure <ul style="list-style-type: none"> • Architectures of Internet of Everything solutions • APIs for Sensors and Actuators • Communication protocol stacks and their intergration • Database integration for IoE (Time-Series etc.) • Application of Data Science in IoE solutions (Big-Data, Smart Data, etc.) • Application of Artificial Intelligence and Deep-Learning in IoE solutions • Integration of cloud-based services 				
4	Application Focus Within a block-week real-world project together with companies are realized. Students test and test these projects within the User Innovation Center.				
5	Scientific Focus Written assignment: literature review in the style of a scientific paper up to 10 pages				
6	Parameters <ul style="list-style-type: none"> • ECTS: 6 • Hours of study in total: 180 • Weekly hours per semester: 4 <ul style="list-style-type: none"> – Contact hours: 60 – Self-Study hours: 120 • Course characteristics: compulsory • Course frequency: every year – summer semester • Maximal capacity: 25 students • Course admittance prerequisites: none 				

	<ul style="list-style-type: none"> • Skills trained in this course: theoretical knowledge, practical skills and scientific competencies • Assessment of the course: Theoretical knowledge (40%): Written Exam at the end of the course, Practical Skills (40%): realizing a small real-world project within the lecture related topics of software intensive solutions and Scientific Competences (20%): written paper (literature review, approx. 10 pages) and presentation (in class or at a student conference, e.g. International Research Conference Dortmund) • Teaching staff: Prof. Dr. Sabine Sachweh, external lecturers from industry and/or partner universities, PhD students from IDiAL
7	<p>Learning outcomes</p> <p>7.1 Knowledge</p> <ul style="list-style-type: none"> • Know the difference between IoT and IoE • Know the different architectures of Internet of Things • Know several related technology stacks • Know the most relevant communication protocols and APIs • Know the requirements of various types of databases • Know the difference between actuating elements, sensors, and devices • Know the purpose of artificial intelligence <p>7.2 Skills</p> <ul style="list-style-type: none"> • Can identify and define the requirements for an Internet of Everything application • Can apply different tools for designing an IoE application • Can assess existing solutions in the area of IoE and cloud-services <p>7.3 Competence – attitude</p> <ul style="list-style-type: none"> • Can discuss Internet of Everything in the scientific context • Can present and defend results • Can understand and translates IoE related stuff between different domains
8	<p>Teaching and training methods</p> <ul style="list-style-type: none"> • Theoretical knowledge: e-learning modules on software-intensive systems, tool tutorials • Practical Skills: Project work within the User Innovation Center, Labs, and Exercises • Scientific Competences: extract information of published papers about the relevant topics for the provided course-content
9	<p>Course mapping</p> <p>Input for:</p> <p>MOD-E01 Software Engineering Project</p> <p>Input from:</p> <p>MOD1-02 Software Architectures</p> <p>MOD1-03 Digital Systems 1</p>
10	<p>References</p> <p>Prof. Dr.-Ing. habil. Hartmut Janocha, Adaptronics and Smart Structures, Springer 2007</p> <p>Taewan You, Toward the future of Internet architecture for IoE, ICTC 2016</p> <p>Emil Vassev, Mike Hinchey, Awareness in Software-Intensive Systems, IEEE Computer Society 2012</p>

	<p>Marcelo Benites Gonçalves, Everton Cavalcante, Towards a Conceptual Model for Software-Intensive System-of-Systems, ieee international conference on systems, man and cybernetics 2014</p> <p>Grayson Honan, Tolga Soyata, Internet-of-Everything Oriented Implementation of Secure Digital Health (D-Health) Systems, ISCC 2016</p>
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