



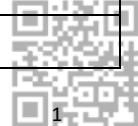
English version: p 4-6

More details about the elective: p 7ff

## Modulbeschreibung Blockwochenmodul:

Modultitel	Extended Reality RMS (XR-RMS)			
anbietender Studiengang	Biomedizinische Informationstechnik und Informationstechnik			
Hochschulstandort	Fachhochschule Dortmund (Campus Sonnenstraße)			
Sprache	English			
Modulbeauftragte/r hauptamtlich Lehrende	Prof. Dr. Karsten Lehn			
Kontakt	Karsten.lehn@fh-dortmund.de			

Abkürzung	Workload	Credits*	Semester (WiSe/SoSe)	geplante Gruppengröße	
XR-RMS	150	*5	SoSe	Minimum	Maximum
				5	16
	Kontaktzeit		Selbststudium		
	Präsenzzeit während der Blockwoche	Zusätzliche Kontaktzeit in der Vor- und Nachbereitungsphase z.B. Videokonferenzen	angeleitet in der Vor- und Nachbereitungsphase	selbstgesteuert	
	35	9	6	100	
Lehrveranstaltungen/ Lehrformen Präsenzzeit	<p>Die Vorlesung (V/SV) findet in seminaristischer Form statt. In dem Praktikum werden aktuelle wissenschaftliche Erkenntnisse analysiert, Vorträge vorbereitet und vorgetragen. Diese Erkenntnisse werden genutzt, um Anwendungskonzepte und prototypische Lösungen in Projekten umzusetzen.</p> <p>Die Veranstaltungsteile in Präsenz finden überwiegend in der Blockwoche statt. Es ist Präsenz zu zwei vorgegebenen Terminen zum Beginn und zum Ende des Semesters erforderlich. Ein großer Teil der Leistung ist als eigenverantwortliche Arbeit zu erbringen.</p> <p>Sprache</p> <ul style="list-style-type: none"><li>- Lehrveranstaltung: englisch, ggf. deutsche Anteile</li><li>- Prüfung: englisch</li><li>- Literatur: englisch</li></ul>				



Lehrformen Vorbereitungsphase	<b>Einführung in Präsenz, online und eigenverantwortliches Arbeiten</b>
Lehrformen Nachbereitungsphase	<b>Eigenverantwortliches Arbeiten und Abschluss in Präsenz</b>

\* Es besteht die Möglichkeit zusätzliche ECTS-Punkte durch Zusatzleistungen zu erwerben.  
Die Absprache mit dem Lehrenden muss vor der Wahl dieses Moduls stattfinden.

#### Lernergebnisse/Lernziele/Kompetenzen

The students can explain Extended Reality (XR) terms, concepts and human perceptual aspects in a scientific way. They can differentiate instances of Extended Reality (XR), especially Virtual Reality (VR) und Augmented Reality (AR). The students can scientifically describe the functionality of the building blocks of an XR system. Moreover, they can classify and explain the role of these components in their interaction with users for generating immersive experience in a virtual or augmented world. The students can combine their knowledge with current scientific findings and insight und their background in informatics and programming to develop complex application concepts and complex prototypical XR applications.

#### Inhalte

- Introduction and differentiation
- Extended Reality (XR) applications
- Tracking
- Aspects of human perception
- XR input and output devices
- Aspects of human-computer Interaction

#### Teilnahmevoraussetzungen

Formell: Die Zulassung zu der Modulprüfung XR-RMS ist zu versagen, wenn bereits eines der Module Extended Reality (XR) oder Extended Reality 2 (XR2) aus einem der anbietenden Studiengänge (siehe oben) bestanden ist. Die Zulassung zu der Modulprüfung XR-RMS ist unzulässig, wenn die Modulprüfungen XR oder XR2 innerhalb desselben Prüfungszeitraumes oder die dafür vorgesehenen Prüfungstermine spätestens zu Beginn des folgenden Semesters stattfinden sollen.

Inhaltlich: Informatik-/Programmierkenntnisse, Interesse an der Extended Reality (XR)  
Nützlich sind Erfahrungen in der Modellierung in Blender, Maya o.ä. und der Entwicklung mit einer Spiele-Engine.





Prüfungsformen	Hausarbeiten und Referate und projektbezogene Arbeiten
Voraussetzungen für die Vergabe von Kreditpunkten	Modulprüfung muss bestanden sein.
Verwendung des Moduls (in anderen Studiengängen)	siehe hierzu Homepage der Ruhr Master School
Literatur	<p>[1] Jerald, Jason (2016). The VR Book: Human-Centered Design for Virtual Reality (Acm Books). Morgan &amp; Claypool Publishers-Acm.</p> <p>[2] LaValle, Steven M. (2023). Virtual Reality. Als E-Book verfügbar unter <a href="http://lavalle.pl/vr/">http://lavalle.pl/vr/</a>.</p> <p>[3] Schmalstieg, Dieter, Höllerer, Tobias (2016). Augmented Reality: Principles and Practice. Boston: Addison-Wesley.</p> <p>Weiterführende Literaturhinweise werden in der Lehrveranstaltung bekanntgegeben.</p>
Anmerkungen	

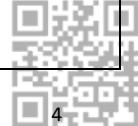


## Module Description for Block Week Module:

**Note: Only the German version of this Module Description is legally binding**

<b>Module title</b>	Extended Reality RMS (XR-RMS)
Offering course of studies	Biomedizinische Informationstechnik and Informationstechnik
University Campus	Fachhochschule Dortmund (Campus Sonnenstraße)
Language	English
Module representative/ Full-time lecturer	Prof. Dr. Karsten Lehn
Contact	Karsten.lehn@fh-dortmund.de

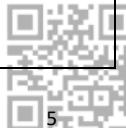
Abbreviation	Workload	Credits	Semester (WiSe/SuSe)	Planned group size			
<b>XR-RMS</b>	<b>150</b>	<b>*5</b>	<b>SuSe</b>	minimum	maximum		
				5	16		
Courses/course types Attendance	Contact time		Self-study				
	Attendance during block week	Additional contact time during preparation and postprocessing e.g. videoconference	Guided during preparation and postprocessing	self-directed			
	<b>35</b>	<b>9</b>	<b>6</b>	<b>100</b>			
Courses/ Teaching methods Attendance time	<p>The lecture (V/SV) takes place in seminar-style. In the practical course, current scientific findings are analysed and presentations are prepared and presented. These findings are used to realise application concepts and prototype solutions in projects.</p> <p>The parts in presence of the course mainly take place in the block week. Attendance is required at two specified dates at the beginning and end of the semester. A large part of the work is self-directed.</p> <p>Language</p> <ul style="list-style-type: none"> <li>- Course: English, German parts if necessary</li> <li>- Examination: English</li> <li>- Literature: English</li> </ul>						



Teaching types preparation	<b>Introduction in presence, online and self-directed work</b>
Teaching types postprocessing	<b>Self-directed work, finalisation in presence</b>

\* It is possible to acquire additional ECTS points through additional work. If desired, the lecturer must be consulted before choosing this module..

Teaching results/ teaching goals/competences	
<p>The students can explain Extended Reality (XR) terms, concepts and human perceptual aspects in a scientific way. They can differentiate instances of Extended Reality (XR), especially Virtual Reality (VR) und Augmented Reality (AR). The students can scientifically describe the functionality of the building blocks of an XR system. Moreover, they can classify and explain the role of these components in their interaction with users for generating immersive experience in a virtual or augmented world. The students can combine their knowledge with current scientific findings and insight und their background in informatics and programming to develop complex application concepts and complex prototypical XR applications.</p>	
Contents	
	<ul style="list-style-type: none"> <li>• Introduction and differentiation</li> <li>• Extended Reality (XR) applications</li> <li>• Tracking</li> <li>• Aspects of human perception</li> <li>• XR input and output devices</li> <li>• Aspects of human-computer Interaction</li> </ul>
Participation requirements	<p>Formal: Admission to the module examination XR-RMS must be refused if one of the modules Extended Reality (XR) or Extended Reality 2 (XR2) from one of the degree programmes offered (see above) has already been passed. Admission to the module examination XR-RMS is not permitted if the module examinations XR or XR2 are to take place within the same examination period or the examination dates scheduled for them are to take place at the latest at the beginning of the following semester.</p> <p>Content wise: Computer science/programming skills, interest in extended reality (XR)      Experience in modelling using Blender, Maya or similar and development using a game engine are useful.</p>
Examination types	Term papers and presentations and project-related work
Requirement for rewarding credit points	Module examination must be passed.
Application of the modul (in other courses)	see homepage of Ruhr Master School



Literature	<p>[4] Jerald, Jason (2016). The VR Book: Human-Centered Design for Virtual Reality (Acm Books). Morgan &amp; Claypool Publishers-Acm.</p> <p>[5] LaValle, Steven M. (2023). Virtual Reality. Als E-Book verfügbar unter <a href="http://lavalle.pl/vr/">http://lavalle.pl/vr/</a>.</p> <p>[6] Schmalstieg, Dieter, Höllerer, Tobias (2016). Augmented Reality: Principles and Practice. Boston: Addison-Wesley.</p> <p>Further literature references will be announced in the course.</p>
Notes	





# Extended Reality (XR)

Compulsory elective module in the Master's  
degree programmes

Biomedizinische Informationstechnik,  
Informationstechnik and for Ruhr Master School

Teaching language:

Englisch

Max. number of  
participants (XR, XR2  
and RMS in total): 16

Sommersemester 2024

Prof. Dr.-Ing. Karsten Lehn

Karsten.Lehn@fh-dortmund.de

# Video zur Extended Reality (XR)-Lehrveranstaltung

<https://video.fh-dortmund.de/video/Extended-Reality-28XR29-in-der-Lehre/80b40b47663fc6aecc25b895e65eff0>

Extended Reality (XR) in der Lehre



Teilen  
Prof. Dr.-Ing. Karsten Lehn



# Variant for Ruhr Master School

## Extended Reality (XR) for Ruhr Master School (RMS)

- 5 ECTS – Other variants potentially possible
- Fixed dates:
  - One date in the first week (from 8.4.2023): Introduction and borrowing of headset - In presence in Dortmund
  - One date in the third week: Unity introduction – online
  - 13 May - 17 May 2024: Block week - In presence in Dortmund
  - Last week (from 8 July 2024): Result presentation and return of the headset - In presence in Dortmund
  - Detailed schedule will be communicated as soon as the timetable is available
- Mainly self-directed learning using the XR Toolbox, lecture material and [learn.unity.com](https://learn.unity.com)
- Main task: Development of a Unity XR project of your choice in consultation with the lecturer
  - Scientific basis in a defined area, e.g. from your degree programme or another interesting field
  - Scientific reference to the lecture content

# Learning Outcomes/ Competences

- The students can explain Extended Reality (XR) terms, concepts and human perceptual aspects in a scientific way. They can differentiate instances of Extended Reality (XR), especially Virtual Reality (VR) und Augmented Reality (AR).
- The students can prepare, present, analyze and evaluate selected scientific findings and insights. They can scientifically describe the functionality of the building blocks of an XR system.
- Moreover, they can classify and explain the role of these components in their interaction with users for generating immersive experiences in a virtual or augmented world. The students can combine their knowledge with current scientific findings and insights und their background in informatics and programming to develop application concepts and prototypical XR applications.

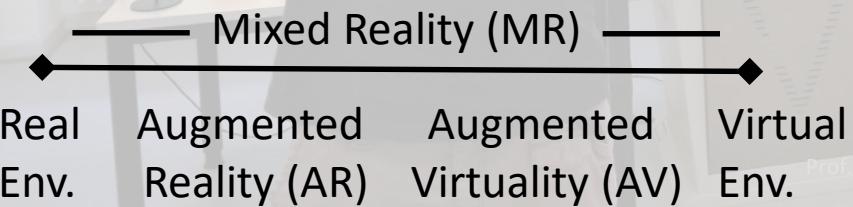
# HW Requirements

- Mobile computer (Notebook) that meets the requirements at the following link. <https://docs.unity3d.com/Manual/system-requirements.html>
  - USB-C
- For some augmented reality applications, students might need a suitable Android mobile phone
  - Requirements: <https://docs.unity3d.com/Manual/system-requirements.html>
- Some virtual reality headsets, virtual reality viewers for mobile phones can be borrowed during the course

# Extended Reality(XR)



VR



AR

Image: Matthias Feldbrügge

# Innovative XR Applications

- How do innovative and new XR application concepts look like?
- Which are important human-factor aspects?
- Which are important technological aspects?



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Prof. Dr.-Ing. Karsten Lehn



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# Contents

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- Aspects of human-computer Interaction



# XR headsets



# XR technology



# XR Toolbox

- Support for induction and implementation through the XR Toolbox, which was specially developed for the faculty of information technology.
- Tutorials, Videos (German language)
- Applications as demos and toolbox item



# Course

- Experience-oriented teaching
- Analyzing and presenting current scientific XR findings (only XR and XR2)
- Concepting of innovative XR applications based on a scientific background (only XR)
- Prototyping and evaluating an XR application (XR2 and RMS)
- Using AR and VR devices
- Software development (programming) using a game engine
- Project work
- Working in teams (depending on number of participants)

Contact: Karsten.Lehn@fh-dortmund.de

# Literature

- Jerald, Jason (2016). The VR Book: Human-Centered Design for Virtual Reality (Acm Books). Morgan & Claypool Publishers-Acm.
- LaValle, Steven M. (2023). Virtual Reality. Als E-Book verfügbar unter <http://lavalle.pl/vr/>.
- Schmalstieg, Dieter, Höllerer, Tobias (2016). Augmented Reality: Principles and Practice. Boston: Addison-Wesley.