

**Lehrform** (*teaching format*) / **SWS** (*hours per week*): 2VL + 2UE

**Kreditpunkte** (*credit points*): 6

**Turnus** (*frequency*): usually, each winter term

**Inhaltliche Voraussetzungen** (*content-related prior knowledge/skills*): NONE

**Sprache** (*language*): English

**Lehrende** (*teaching staff*): AG Künstliche Intelligenz (Prof. Michael Beetz, PhD)

<b>Studiengang</b> ( <i>degree program</i> )	<b>Module</b>	<b>Semester</b>
Informatik (Master)	IMAP, IMA-AI	ab 1.Sem.
AI and Intelligent Systems (Master)	AI-F-IIS	1st sem.
Systems Engineering I/II (Master)	M07-IM-AuR-INF	ab 1./2.Sem.
Informatik (Bachelor)	(nur <i>Freie Wahl</i> )	

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**Lernergebnisse** / *Learning Outcome*:

The students

- are familiar with the current techniques for implementing technical cognitive systems,
- can apply typical programming methods for technical cognitive systems,
- are familiar with possible application scenarios for technical cognitive systems,
- are able to assess and discuss ethical challenges arising from the development and use of artificial intelligence

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**Inhalte** / *Contents*:

The lecture deals with current techniques for the implementation of technical cognitive systems, i.e. intelligent computer systems that have sensors and actuators. Such systems are mainly used in areas such as service robotics, smart homes, autonomous space probes, and driver assistance systems.

The following topics are covered:

- Sensors, actuators and hardware infrastructure of technical cognitive systems, sensor models and noise
- Basics of monocular and stereo computer vision
- Control of technical cognitive systems: forward and inverse kinematics, dynamics
- Basics of probabilistic state estimation: Bayesian filters, Kalman filters, particle filters, mechanisms for data association, learning of sensor and action models, hidden Markov models, expectation maximization
- Applications of probabilistic state estimation: localization, environment mapping, object tracking
- Programming methods for technical cognitive systems: rational agent model, concurrent reactive control, knowledge and plan-based control, learning-based agents

In this lecture, ethical challenges are discussed that arise from the challenges posed by the development and use of Artificial Intelligence. The opportunities and possibilities of AI are also discussed as well as international initiatives by researchers and developers, such as the Ethical Aligned Design (IEEE), which have developed criteria for the responsible use of AI.

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**Hinweise** (*remarks*): The table lists only the primary / most specific modules to which this course is assigned.