Technology
Arts Sciences
TH Köln

# Course Manual ATS

Autonomous Systems

Version: 1 | Last Change: 25.09.2019 12:20 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

## General information

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|---|---|
| **Long name** | Autonomous Systems |
| **Approving CModule** | ATS_BaET, ATS_BaTIN |
| **Responsible** | Prof. Dr. Chunrong Yuan<br>Professor Fakultät IME |
| **Valid from** | summer semester 2023 |
| **Level** | Bachelor |
| **Semester in the year** | summer semester |
| **Duration** | Semester |
| **Hours in self-study** | 69 |
| **ECTS** | 5 |
| **Professors** | Prof. Dr. Chunrong Yuan<br>Professor Fakultät IME |
| **Requirements** | Capability of algorithm analysis and implementation<br>Knowledge of signal processing and mathematics<br>Capability of software and project development<br>Basic knowledge of embedded software |
| **Language** | German and English |
| **Separate final exam** | Yes |

### Literature

Hertzberg: Mobile Roboter: Eene Einführung aus Sicht der Informatik, Springer Vieweg, 2012

### Final exam

| | |
|---|---|
| **Details** | Oral exam, with the option of written examination if necessary (e.g.: in case of a large number of participants) |
| **Minimum standard** | At least 50% with correct answers |
| **Exam Type** | EN mündliche Prüfung, strukturierte Befragung |

## − Lecture / Exercises

### Learning goals

| Goal type | Description |
|---|---|
| Knowledge | Sensors<br>Wheel/motor sensors<br>Heading sensors<br>Positioning sensors<br>Cameras<br>Locomotion<br>Wheeled mobile robots<br>Legged mobile robots<br>Data processing and feature extraction<br>Edge detection<br>Line extraction<br>Point detection and description<br>Recognition and Modelling<br>Object detection<br>Place recognition<br>3D motion and structure estimation<br>Navigation<br>Localization<br>Mapping<br>Path planning |

### Special requirements

none

| | |
|---|---|
| **Accompanying material** | Lecture slides |
| **Separate exam** | No |

### Expenditure classroom teaching

| Type | Attendance (h/Wk.) |
|---|---|
| Lecture | 2 |
| Tutorial (voluntary) | 0 |

## − Practical training

### Learning goals

| Goal type | Description |
|---|---|
| Skills | Teamwork: Development of systems with intelligent behaviours for autonomous interpretation of sensor data and real-time robot control. The goal is to realize prototypes with the required functions. |

### Expenditure classroom teaching

| Type | Attendance (h/Wk.) |
|---|---|
| Practical training | 0.5 |
| Tutorial (voluntary) | 0 |

### Special requirements

none

| | |
|---|---|
| **Accompanying material** | Documents with task descriptions as well as instructions on project implementation development tools and examples |
| **Separate exam** | Yes |

### Separate exam

| | |
|---|---|
| **Exam Type** | EN Projektaufgabe im Team bearbeiten (z.B. im Praktikum) |
| **Details** | Evaluation of the achieved results based on presentations, live demonstrations, discussions as well as documentations in form of texts, source codes, graphic illustrations and video clips |
| **Minimum standard** | On-schedule delivery, presentation and demonstration of the realized systems according to task descriptions. |

## − Lecture / Exercises

### Learning goals

| Goal type | Description |
|---|---|
| Skills | Sensor characterization<br>Feature extraction<br>Image matching and clustering<br>Image based place recognition<br>Motion analysis<br>Programming of robot behaviour |

### Special requirements

Be prepared to use Python and install all the necessary software tools on one's own laptop

| | |
|---|---|
| **Accompanying material** | Practical exercises<br>Example programs |
| **Separate exam** | No |

### Expenditure classroom teaching

| Type | Attendance (h/Wk.) |
|---|---|
| Exercises (whole course) | 1 |
| Exercises (shared course) | 1 |
| Tutorial (voluntary) | 0 |

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