# Estimation for Autonomous Mobile Robots

Winter

(in German: Estimation for Autonomous Mobile Robots )

## Module-ID: FIN-INF-120485

| Abbreviation | Credit Points | Semester | Term | Duration | Language | Level |
|---|---|---|---|---|---|---|
| AMR | 6 | Winter | starting at 1. | 1 Semester | english | Master |

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|---|---|
| **Link:** | LSF |
| **Limited accessability:** | false |
| **Responsibility:** | Prof. Dr.-Ing. Benjamin Noack |
| **Lecturer:** | Prof. Dr.-Ing. Benjamin Noack |
| **Classes:** | • Lecture *Estimation for Autonomous Mobile Robots*<br>• Exercise *Estimation for Autonomous Mobile Robots* |

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|---|---|
| **Applicability in curriculum:** | - M.Sc. INF: Informatik<br>- M.Sc. INF: Informatik Wahlpflicht (SPO 2027)<br>- M.Sc. INGINF: Informatik<br>- M.Sc. INGINF: Ingenieurinformatik<br>- M.Sc. WIF: Informatik<br>- M.Sc. WIF: Informatik Wahlpflicht (SPO 2027)<br>- M.Sc. DKE: Applied Data Science<br>- M.Sc. DE: Methoden des Digital Engineering<br>- M.Sc. DE: Methoden der Informatik<br>- M.Sc. DE: Fachliche Spezialisierung<br>- M.Sc. DE: Informatik Wahlpflicht (SPO 2027)<br>- M.Sc. DE: Digital Engineering (SPO 2027)<br>- M.Sc. DE: Engineering Specialization (SPO 2027)<br>- M.Sc. VC: Computer Science<br>- M.Sc. VC: Computer Science (SPO 2027) |

**Intended learning outcomes:**
Students who complete the course ...

- have an overview of basic problems and methods in parameter and state estimation for mobile systems.
- understand how to develop kinematic models for mobile robots and how to derive discrete-time prediction models.
- are familiar with the required mathematical tools and can derive and apply least-squares methods for localization and tracking of mobile systems, e.g., based on distance measurements.
- have a deep understanding of Kalman filtering and its nonlinear generalizations for dynamic state estimation and localization of mobile systems.

**Content:**

- Kinematics, System Models, and Dead Reckoning for Mobile Systems
- Sensor Models and Optimization Methods for Localization and Tracking
- DynamicState Estimation for Real-Time Localization and Tracking
- Linear Kalman Filtering and Nonlinear Generalizations

**Workload:**
56 h contact time 124 h independent study

| Pre-examination requirements: | Type of examination: | Teaching method / lecture hours per week (SWS): |
|---|---|---|
| | Oral exam (30 min) | • Lecture (2 SWS)<br>• Exercise (2 SWS) |

| Prerequisites according to examination regulations: | Recommended prerequisites: |
| --- | --- |
| none | Linear Algebra, Analysis |

| Media: | Literature: |
| --- | --- |
| | Literature will be announced in the lecture. |

**Comments:**

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