Advanced Process Control					AR-301
Rota annually WS	**Duration** 1 Semester	**Semester** 3rd (Semester)	**SWS** 4 SWS	**Credit Points** 5	**Workload** 150 h

1	**Modul Structure**				
	Course (Abbreviation)	**Type/ SWS**	**Presence**	**Self Study**	**Credit Points**
	a) Advanced Process Control (APC)	Lecture / 2 SWS	30 h	60 h	3
	b) Advanced Process Control (APC)	Tutorial / 2 SWS	30 h	30 h	2

2 **Language**
English

3 **Content**

1. Summary of the analysis of linear dynamic systems: Stability, controllability, observability observability. Stability of nonlinear systems using Lyapunov theory and summary of nonlinear control design methods.
2. State estimation for linear and nonlinear systems: Kalman Filter, Extended Kalman Filter, Particle Filter, Mov-ing Horizon Estimation.
3. Advanced model-predictive control: linear and nonlinear model predictive control, robust model predictive control, learning-based model predictive control.
4. Efficient implementation of model predictive control.

Literature:

- Slides
- Lecture Notes

4 **Competencies**

The course provides in-depth knowledge of state of the art techniques for advanced process control and prepares for further scientific work in this area and for industrial jobs in process control and operation departments or companies. The students understand the methods listed above and are able to choose the appropriate methods for the solution of practical problems, to synthesize a solution and to evaluate the results.

5 **Examination Requirements**

The final exam will be an oral (max. 30 minutes) or written (2 hours) exam, depending on the number of participants (form will be announced second week of course).

Active participation and collaboration in 75% of computer exercises is mandatory. The students can acquire 15% additional bonus point doing a small controller design project.

6 **Formality of Examination**

☒ Module Finals ☐ Accumulated Grade

7 **Module Requirements (Prerequisites)**

Basic knowledge of dynamic systems and control, as e.g. provided by the course Control Theory and Applications.

8 **Allocation to Curriculum:**

Program: Automation & Robotics, Field of study: Process Automation Robotics, Cognitive Systems

9 **Responsibility/ Lecturer**

Prof. Dr. S. Lucia/ Prof. Dr. S. Lucia