# Advanced Process Control

<table>
<thead>
<tr>
<th>Rota annually WS</th>
<th>Duration 1 Term</th>
<th>Semester 3rd (SEM)</th>
<th>SWS 2 SWS</th>
<th>Credit Points 3</th>
<th>Workload 90 h</th>
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<tbody>
<tr>
<td><strong>Modul Structure</strong></td>
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<tr>
<td><strong>Course (Abbreviation)</strong></td>
<td><strong>Type/ SWS</strong></td>
<td><strong>Presence</strong></td>
<td><strong>Self Study</strong></td>
<td><strong>Credit Points</strong></td>
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<tr>
<td>a) Advanced Process Control (APC)</td>
<td>Lecture / 1 SWS</td>
<td>15 h</td>
<td>45 h</td>
<td>2</td>
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<td>b) Advanced Process Control (APC)</td>
<td>Tutorial / 1 SWS</td>
<td>15 h</td>
<td>15 h</td>
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## Language

**English**

## Content

- Analysis of linear dynamic systems: Stability, controllability, observability, poles, zeros.
- State space controller design techniques: Eigenvalue and eigenstructure assignment by state feedback, observers, Kalman filter, observers for systems unknown inputs, observer-based control.
- Controller design techniques for nonlinear systems: nonlinear observers, extended Kalman filter, gain scheduled controllers, exact feedback linearization.
- Advanced model-predictive control: Linear constrained model predictive control, nonlinear model predictive control, direct optimizing control.

### Literature:

- Slides
- Lecture Notes

## 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.

## Examination Requirements

The final exam will be an oral (20 minutes) or written (1.5 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.

## Formality of Examination

- **Module Finals**
- **Accumulated Grade**

## Module Requirements (Prerequisites)

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

## Allocation to Curriculum:


## Responsibility/ Lecturer

*Prof. Dr. S. Engell/ Prof. Dr. S. Engell*