1	**Course Number**	**Study Program** KEEP/INTAP	**Semester** 2-4	**Offered in** ☒WS, ☒SS	**Duration** 1 Semester	**Course Type** optional	**Workload (h)**	**ECTS Points** 4
2	**Course** **Basic Elements of Feedback Control Technology**		**Teaching and Learning Forms** Lectures, practices and exam preparation		**Contact Time** **(SWS)** 4 (1h=45 min.)	**(h)** **40**	**Self-Study Time** **(h)** 20	**Language** English

3 **Learning Outcomes and Competences**

After successfully completing the module, students will be able to ...

Know and understand

- ... the basic elements and undamental concepts of control systems.
- … basic tools necessary to apply transfer functions, transfer elements and block diagrams in the analysis of engineering systems.

Use, application and generation of knowledge

Use and transfer

- ... use basic analytical tools necessary to apply transfer functions, transfer elements and block diagrams in the analysis of engineering systems.

Scientific innovation

- ... independently carry out optimizations and further developments of control systems.

Overarching competencies

Communication and Cooperation

- ... argue their point of view in technical discussions using basic relations from control systems.

Methodological competence

- ... have learned to solve control systems problems systematically.
- ... name and apply the theoretical basics and methods from the field of control systems relevant to the problem at hand and apply them.

Scientific self-image/professionalism

- ... the students can work independently on scientific projects related to control system issues.

4 **Participation Requirements**

Mathematics, Applied Mechanics, Electric Circuits

5 **Course Contents**

- Introduction to continuous-time control
- Descriptions of control loop elements
- Elementary transfer elements (P, I, D, dead time)
- Lag elements (PT1, IT1, DT1, PT2, PTn)
- Composition of transfer elements for control equipment
- Modelling of transfer systems
- Nyquist plots, Bode diagrams, Stability
- Controller design and control loop synthesis
-

6	**Course Calendar** Section 1 — Section 2 Week 1 Introduction — Description of Control Elements Week 2 Basic Transfer Elements — Exercises Week 3 1st Order Lag Elements — Exercises Week 4 PT_2 Element Transfer Function — Exercises Week 5 PT_2 Element Step Response — Exercises Week 6 Midterm Exam — PTn Element Week 7 Feedback to Mediterm Exam / PID Element — Exercises Week 8 Modelling of Transfer Systems, Frequency Response — Exercises Week 9 Frequency Response, Stability — Exercises Week 10 Exam Preparation — Exercises Week 11 Final Exam
7	**Course Schedule** Two sessions per week with 2 hours per session (1h=45 min.).
8	**Examination Forms and Prerequisites for Awarding ECTS Points** Midterm and final exam written examination 90 min., graded The exam is an open book exam and the students can bring all documents in paper form (scripts and notes) and calculators.
9	**Estimated Student Workload** 40 hours
10	**Further Use of Course** Electrical Engineering, Mechatronics, Mechanical Engineering
11	**Grading Scheme** Total grade: 1/3 midterm exam and 2/3 final exam *Local grading scale Esslingen University:* *1,0/1,3 very good* *1,7/ 2,0/ 2,3 good* *2,7/3,0/3,3 satisfactory* *3,7/4,0 adequate* *4,3/4,7/5,0 insufficient/failed*
12	**Course Manager and Full-Time Lecturer** Prof. Dr.-Ing. Joachim Berkemer
13	**Literature** Lecture scripts with notes, exercises with solutions. Further reading: H. Abel, Hermann Kull, J. van der List, D. P. Looze, G. Walliser: Feedback Control Technology, Esslingen University of Applied Sciences J. Di Stefani, A. Stubberud, I. Williams: Feedback and Control Sysstems. Schaum's Outlines, McGraw-Hill.
14	**Course Registration** Due to the limited number of participants, we ask that you register in advance by emailing kremena.daneva@hs-esslingen.de. You may only participate after receiving confirmation of your enrolment in the course.
15	**Last Updated** 30.04.2026