

## Syllabus: “Introduction to Power System Analysis”

International School, Winter Semester 2022/23

Assoc. Prof. Faruk Ugranli

### (a) Inhalt und Ansatz | Content and Approach

- The course is intended for students of the faculty of electrical engineering and exchange students of all faculties, as an introduction to the analysis and design of electrical power systems.
- Teaching methods are oriented towards student-centred learning and include activities such as lectures, group work, peer review, and consultations with the instructor.
- The course will be offered as an in-person session.
- Students are required to at least have an advanced level of English to follow the lessons.
- Completion of assignments and regular attendance (at least 80% of all sessions) is required for exam admission.
  - The completion of assignments (homework) counts as 50% of the final mark for the course.
- For full credit, students must turn in homework by the day that they are due (i.e., by 11:59 pm Local Time). Late work is allowed, but with a penalty of 20% per day, it is late. Work submitted by a student as makeup work for an excused absence is not considered late work and it is exempted from this late work policy.
- For the successful completion of the course, the student will be awarded 5 ECTS. Therefore, students should be prepared to spend a considerable time working with the study content.
- Participants are required to register for the course via Stud.IP, where all teaching resources will be made available.

### (b) Qualifikationsziele | Learning Objectives

- This course is aimed at introducing the students to the analysis of the design of electrical power systems.
- The lesson topics, that the course focus on, are listed below.

### (c) Kursstruktur | Course Structure

- The class will be held every week (till the end of December), in the following schedule:
  - Monday: 2:30pm to 4pm, in room H0113
  - Tuesday: 10am to 11:30am, in room H0011 and 6pm to 7:30pm in room H0112
  - Wednesday: 8am to 9:30am, in room H0114
  
- The course topics/schedule is as follows:

- Introduction to Class. Introduction to Matlab and Power World Simulator. (3hr.)
- Power systems and their elements, interconnected grid structure, and history of power systems. (4hrs.)
- Phasors, relationships between current-voltage-power-energy in power systems, power factor correction, and the factors that affect power flow. (5hrs)
- Representation of three-phase systems, phasor diagrams, balanced systems, complex power of three-phase power systems. (4hrs)
- Resistance and inductance of transmission lines. (4hrs)
- The capacitance of transmission lines. (3hrs)
- Short, medium, and long three-phase transmission line models, their two-port representations, and their performance. (4hrs)
- Limits for transmission lines, SIL, and compensation for transmission lines. (4hrs)
- Synchronous generators. (5hrs)
- Transformer modeling in power systems. (5hrs)
- Per-unit system. (4hrs)

#### (d) Studien- und Prüfungsleistungen | Course Assessment

- **The exam was already written in December 2022! The exam can't be taken again in February 2023! Only students who already had taken the exam in December will be able to gain a grade and the ECTS points for the course!**
- The final exam is a in person, closed-book, closed-notes written exam. You may bring one note sheet (both sides of A4-sized paper)
- The written exam will be held on 21.12.2022. The room will be announced over Stud.IP.
  - The registered date for the exam is 03.02.2023. Which is not the date the exam will be written, but the date the student will have to register to get a mark on their transcript.
- For the successful completion of the course, the students will be awarded 5 ECTS.
  - The final gate will be based on 50% final exam and 50% homework.