



Course Memo

EG2110 Power System Stability and Control (7.5 credits)

VT24

This course deals with different methods to study and analyze power system dynamics, stability and control. Different power system instabilities will be presented and discussed. Furthermore, different control algorithms for improving power system stability will be presented and discussed.

Intended Learning Outcomes (ILOs)

In order to successfully complete this course, students should be able:

- ILO1. to create mathematical models for describing power system dynamics,
- ILO2. based on the derived mathematical models, to apply different basic methods to
 - a) study and analyze the basic concept of the presented types of power system instabilities,
 - b) improve power system stability based on basic control algorithms,
 - c) describe and analyse the impact of integration of renewable energy on power system dynamics and stability,
- ILO3. numerically perform ILO2 by using MATLAB, and present and discuss the obtained numerical results.

Prerequisites

- Knowledge in analysis of electric power system and load flow calculations, equivalent to course EG2100.
- Knowledge in automatic control, equivalent to course EL1000/EL1110.
- Knowledge in numerical methods and basic programming, equivalent to course SF1519.

Course structure

The course includes lectures, project work hours, and examination. During the project work hours, the teaching assistants will be available to assist the students with the assignments. Please note that teaching assistants will only be available during the project work hours.

Course staff

Course coordinator	Lecturer and examiner:
Manuel Agredano Torres (manuelat@kth.se)	Mehrdad Ghandhari (mehrdad@kth.se)
Teaching assistant:	Teaching assistant:
Manuel Agredano Torres (manuelat@kth.se)	Umbereen Sayyeda (sayyeda@kth.se)
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Code of honor

In this course, the EECS code of honor applies, see:

<http://www.kth.se/en/eecs/utbildning/hederskodex>

Disability

If you have a disability, you may receive support from Funka, KTH's coordinator for students with disabilities, see <https://www.kth.se/en/student/studentliv/funktionsnedsattning>.

Please inform the course coordinator if you have special needs not related to the written exam, and show your certificate from Funka.

- Support measures under code R (i.e. adjustments related to space, time, and physical circumstances) are generally granted by the examiner.
- Support measures under code P (pedagogical measures) may be granted or rejected by the examiner, after you have applied for this in accordance with KTH rules. Normally, support measures under code P will be granted.

Course literature

- Stability of Power Systems, An introduction
- Power System Stability and Control, Exercises

The course literature is available in Canvas.

Canvas

Canvas is an electronic communication platform that we use in the course, where you can find copies of lecture slides, projects, schedule, MATLAB files, etc. Canvas is also the platform where you electronically submit (upload) your reports.

B-number

A unique identification number, called **B-number**, will be given to each student. This B-number will be used as your identification in this course. In order to get a B-number, you have to be registered for the course. You receive your **B-number** by sending an email to the course coordinator. Write B-number in the "subject" of your email, and your name and your KTH email address in the body of your message.

Examination

The course examination is based on the following.

- E1.** Four assignments namely, D1, D2, D3 and D4 which will be presented in a written report, respectively. Each report must be submitted by the given deadline.
- E2.** A scheduled oral presentation (**OP**) of one of the passed reports. Only D1, D2 and D4 are considered for the oral presentation. The course staff select the report to be presented.
- E3.** After marking the reports or after the oral presentation (**OP**), the course staff *may* ask you for an individual meeting to clarify and explain the solutions of the passed report(s). Therefore, the obtained grade(s) in **E1** must be considered *as preliminary* since a failed explanation/clarification results in a failing grade (**F**) for the corresponding report(s).

E1.

Each assignment consists of one part named **Part 1**. The grade used for this part is **P** (passed), **F** (Failed) or **FX**. You receive

- grade **P**, if the total earned points x from each **Part 1** is at least 80% of the maximum available points (**map**). For instance to pass D3, x must be at least $x=0.8*5=4$ points,
- grade **FX**, if $0.7 * \text{map} \leq x < 0.8 * \text{map}$,
- grade **F**, if $x < 0.7 * \text{map}$

Assignments D1, D2 and D4 have also, respectively, an additional part named **Part 2**. The earned points from this part are intended to receive a higher grade (**D-A**) than the grade **E**.

Part 2 of an assignment will be marked if its **Part 1** has been passed.

E2.

The grade used for the oral presentation (**OP**) is **P** or **F**. To receive grade **P**, the following conditions must be met.

- Presentation shows a good understanding of the topic of the assignment.
- The presentation guidelines (see the file OP-guidelines.pptx) are followed.
- Presentation is completed within the given time limit.

If the conditions for grade **P** are not met or if you do not attend the scheduled **OP**-session, the grade for **OP** will be **F**.

Final grade

In order to successfully complete this course with grade **E**, the following necessary requirements (NR) must be met.

- NR1.** You have received a grade **P** on **Part 1** of each assignment.
- NR2.** You have received a grade **P** on the oral presentation (**OP**).
- NR3.** The necessary requirements **NR1** and **NR2** are met during the current academic year, i.e. passed **OP** or reports from previous academic years will not be accepted.

Providing that a grade **E** has been received (i.e. **NR1-NR3** have been met), for awarding a higher grade the earned points from **Part 2** will be considered as shown in the table below.

Total earned points x from Part 2 (max. 20 points)	Grade
$x > 15$	A
$10 < x \leq 15$	B
$5 < x \leq 10$	C
$3 < x \leq 5$	D

Grade FX:

If you receive grade **FX** on **Part 1** of an assignment, you will be offered a new opportunity to revise this part. The course examiner will inform you when and where to submit the revised **Part 1**.

Re-examination

The course has no re-examination. However, if you receive a grade **F** on **OP** and/or on an assignment you will be offered a new opportunity to perform your **OP** and/or to revise and resubmit the failed assignment ***but only Part 1***. **Part 2** will not be marked (or considered) on this opportunity.

The course examiner will schedule the date and time for this extra OP, and will also inform you when and where to resubmit the revised report.

Improving passing grade

A passing grade cannot be improved.

Plagiarism

All the reports will be checked for plagiarism, and if the plagiarism of text, code, or figures is found then strict action will be taken against the corresponding student, based on KTH rules.