# Course Memo

## EG2110 Power System Stability and Control (7.5 credits)

## VT22

This course deals with advanced methods for analysis of power system dynamic, stability and control. Different power system instabilities will be presented and discussed. Furthermore, different control algorithms for improving power system stability will be presented.

**Intended Learning Outcomes (ILOs)**

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

ILO1. create mathematical models for describing power system dynamics,

ILO2. based on the derived mathematical models, 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 effect of integration of renewable energy on power system dynamics and stability,

ILO3. numerically perform ILO2 by using MATLAB, and present and discuss obtained numerical results.

| **Prerequisites** | **Language** |
|---|---|
| Load flow calculations and basic control theory | English |

**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 n**ote that teaching assistants will only be available during the project work hours.**

**Course staff**

| **Course coordinator** | **Lecturer and examiner:** |
|---|---|
| Angel Clark ( angcla@kth.se ) | Mehrdad Ghandhari ( mehrdad@kth.se ) |
| **Teaching assistant:** | |
| Angel Clark ( angcla@kth.se ) | |
| Danilo Obradovic ( daniloo@kth.se ) | |

**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**

The course literature consists of two compendia (which are available in Canvas)

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

**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 first 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 consists of 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 for an individual meeting to clarify and explain the solutions of the passed report(s). Therefore, the obtained grades in **E1** must be considered ***as preliminary*** since a failed explanation/clarification results in a failing grade (**F**) for the corresponding report(s).

**Grading criteria**

The grades used for assessing the criteria are

- **P or F** for D3 and OP, respectively.
- **1p, 3p, 5p or F** for D1, D2 and D4, respectively.

The following criteria will be applied to the written reports and the oral presentation (OP).

**OP**

- Grade **P**:
  - ✓ Presentation show a good understanding of the topic of the assignment.
  - ✓ The presentation guidelines (see the file OP-guidelines.pptx) are followed.
  - ✓ The presentation is completed within the given time limit.
- Grade **F**:
  - ✓ If the conditions for grade **P** are not met.

**D3**

- Grade **P**:
  - ✓ Solutions show a good understanding of the topic of the assignment.
  - ✓ All numerical answers are correct, however a very few ***insignificant*** mistakes in the non-numerical answers (such as explanation or derivation) can be accepted.
  - ✓ The requirements for written report are met.
- Grade **F**:
  - ✓ If the conditions for grade **P** are not met.

**D1, D2 & D4**

Each assignment consists of three parts, namely Part 1, Part 2 and Part 3. For each part, the following criteria will be applied,

- Grade **P**:
  - ✓ Solutions show a good understanding of the topic of the Part.
  - ✓ All numerical answers are correct, however a very few ***insignificant*** mistakes in the non-numerical answers (such as explanation or derivation) can be accepted.
  - ✓ The requirements for written report are met.
- Grade **F**:
  - ✓ If the conditions for grade **P** are not met.

To pass each assignment (i.e. D1, D2 and D4), a grade **P** in Part 1 of each assignment is required. Part 2 and Part 3 will not be marked if a grade **F** has been assigned to Part 1.

Furthermore, for each assignment

1. you earn **1 p.** if Part 1 is passed,
2. you earn **3 p.** if Part 1 **and** Part 2 are passed,
3. you earn **5 p.** if Part 1, Part 2 **and** Part 3 are passed.

**Final grade**

In order to successfully complete this course and to earn 7.5 credits, the following necessary requirements (NR) must be fulfilled.

**NR1.** You have passed all written reports, i.e. D1-D4.

**NR2.** You have passed 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.

The table below shows the course final passing grades providing that **NR1-NR3** have been met. The points are based on the total earned points from D1, D2 and D4.

| Total earned points | Grade |
|---|---|
| 15 | **A** |
| 11 or 13 | **B** |
| 9 | **C** |
| 5 or 7 | **D** |
| 3 | **E** |

**Grade FX:**

If you have received grade **FX**, please contact the course examiner.

1. If you have received **FX** in OP, you will be offered a new opportunity to perform your OP. The date and time for this extra OP will be scheduled by the course examiner.
2. If you have received **FX** in Part 1 of a written report, you will be offered a new opportunity to revise the Part 1 of your report. The course examiner will inform you when and where to submit the revised report.

**Re-examination**

Since this is a project-based course, there is no re-exam for this course. The next examination opportunity will be in next academic year.

**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.

For more information regarding plagiarism, please visit Cheating and plagiarism | KTH