



KTH Electrical Engineering

EG2050 SYSTEM PLANNING

INTRODUCTION

Spring 2013

BACKGROUND



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- Challenges for the power system:
 - Economic efficiency
 - Reliability
 - Environmental impact
- In order to deal with these issues, it is important to understand how a power system is operated.
- This course introduces basic operational procedures and planning tools for the power system.

GENERAL SYSTEM PLANNING

This course considers electric power systems; however, there are similarities to planning of other technical systems.

Table 1.1 Comparison of the planning for different systems

System	Regulation	Operation	Planning	Investments
Aviation	technical function of aircraft and ground control	emergency plans, keeping schedules, economical flying	air routes, maintenance, pricing	new aircraft
Papermill	machine function	economical operation, varying raw material, optimal quality	submitting offers, pricing, maintenance	new machines
Office	the individual task of each co-worker	coordination, deadlines	submitting offers, estimating costs, education	new staff, new equipment, new premises
Power system	primary control, secondary control	coordination of power plants, economical operation	pricing, maintenance	new power plants, grid expansion, long-term contracts

seconds
technology
security



years
economy
uncertainty



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ELECTRICITY MARKETS

Course Objectives

- **To pass:** Describe the principles of how an electricity market can be organised.

Learning Activities

- Lecture 1–2 and lecture assignments.

Exam

- **To pass:** Problem 1.



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ELECTRICITY PRICING

Course Objectives

- **To pass:** Perform rough estimations of electricity prices.
- **Higher grade:** Identify factors that have a large importance for the electricity pricing, and indicate how these factors affect for example producers and consumers.



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Learning Activities

- Lecture 3–4 and lecture assignments.
- Home assignments part I.

Exam

- **To pass:** Problem 2.
- **Higher grade:** Problem 6.

FREQUENCY CONTROL

Course Objectives

- **To pass:** Explain how the balance between production and consumption is maintained in an electric power system, and calculate how the frequency is affected by various events in the power system.
- **Higher grade:** Determine if the frequency control of an electric power system has sufficient margins, and if necessary be able to choose between various measures to increase the margins.



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Learning Activities

- Lectures 5–6 and lecture assignments.
- Home assignments part II.

Exam

- **To pass:** Problem 3.
- **Higher grade:** Problem 7.

SHORT-TERM PLANNING

Course Objectives

- **To pass:** Formulate short-term planning problems of hydro-thermal power systems.
- **Higher grade:** Create specialised models for short-term planning problems.

Learning Activities

- Lectures 7–10 and lecture assignments.
- Home assignments part III.

Exam

- **To pass:** Problem 4.
- **Higher grade:** Problem 8.



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SIMULATION OF ELECTRICITY MARKETS

Course Objectives

- **To pass:** Apply both probabilistic production cost simulation and Monte Carlo simulation to calculate expected operation cost and risk of power deficit in an electricity market.
- **Higher grade:** Create specialised models both for probabilistic production cost simulation and Monte Carlo simulation, and use the results of an electricity market simulation to judge the consequences of various actions in the electricity market.



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SIMULATION OF ELECTRICITY MARKETS



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Learning Activities

- Lectures 11–18 and lecture assignments.
- Home assignments part IV.

Exam

- **To pass:** Problem 5.
- **Higher grade:** Problem 9.

EXAMINATION

- Laboratory course (0.5 hp)
- Written exam (7.0 hp)
 - The laboratory course should be completed before you write the exam.
 - Students who passed the old laboratory course (which consisted of a computer assignment) will not have to do the new laboratory course.



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EXAMINATION - Laboratory course



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- Comprises selected home assignment problems with a total score of 50 lab points.
- 45 lab points are required to pass the laboratory course.
- Lab points are acquired by preparing oral presentations to be given at the **home assignment seminars**.

EXAMINATION - Laboratory course



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- At the beginning of each seminar, all participating students state which problems they are prepared to present.
- The students should also hand in a copy of their presentation.
- In the **ordinary** seminars, one student per problem will be selected to give the presentation.
- In the **repetition occasions**, each student will present one or more problems.

EXAMINATION - Laboratory course



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- If a student has passed all presentations during a seminar (or if the student is not selected to present) then lab points will be rewarded for all assignment that the student has prepared.
- However, if a student fails at least one oral presentation, no lab points at all will be rewarded for this seminar, regardless of which other assignments that the student have been prepared to present!

EXAMINATION - Laboratory course



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Requirements to pass a presentation:

- The presentation must be completed within the time limit.
- The presentation must be performed individually.
- The presentation must be clear.
- The solution must be reasonable.
- The student must be able to answer questions after the presentation.

EXAMINATION - Written exam

The following aids are allowed during the exam:

- Calculator without information relevant to the course.
- One **hand-written**, single-sided A4-page with **your own notes** (original, not a copy). This page should be handed in together with the exam.



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EXAMINATION - Written exam

The exam is divided in two parts.

- In the first part you show that you master the basic requirements to pass the course.
- In the second part you show that you master the requirements for obtaining a higher grade (A–D).
- The second part will only be marked if the student passed the first part!



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EXAMINATION - Written exam



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- Some home assignments reward bonus points for the exam.
- These home assignments are presented in written reports.
- The bonus points are valid for the exams in March and June this year.
- Requirements to get bonus points:
 - The report must be submitted in time.
 - The report must be an individual work.
 - The solution must be clear and correct.

EXAMINATION - Grading



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Score from part I	Total score (part I + part II + bonus)	Grade
0–30	–	F
31–32	–	Fx
33–40	33–59	E
33–40	60–69	D
33–40	70–79	C
33–40	80–89	B
33–40	90–115	A

PRACTICAL INFORMATION

Course web pages

www.kth.se/social/course/EG2050

Language

- Lectures are given in English.
- Compendium, assignments and exams are available in English and Swedish.
- Home assignments seminars are available in English and Swedish.



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PRACTICAL INFORMATION

Course registration

In order for us to keep track of student results, all active students (new and old) must fill out a registration form. Go to KTH Social, choose Course registration in the menu to the right and follow the link.



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PRACTICAL INFORMATION

Course mail box

Address: Teknikringen 33, entrance hall, 1st floor

Student office

Address: STEX, Osquldas väg 10

Open Monday–Friday 9:30–11:00, 12:00–14:00

Student room

Address: Teknikringen 33, room 2412



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