



Course memo, spring 2021

EI2410 Field Theory for Guided Waves (7,5 credits)

1 General and administrative

1.1 Course information on the web

<https://canvas.kth.se/courses/21382> (in Canvas: specific for this offering)
<https://www.kth.se/student/kurser/kurs/EI2410/> (course-plan)

1.2 Service center and student expedition

<https://www.kth.se/eecs/student-support>
student-support@eecs.kth.se
Here you get help with administrative matters.

1.3 Department

Electrical Engineering, Teknikringen 29-33

1.4 Course responsible, lecturer and examiner

Martin Norgren, 08-790 7410, mnorgren@kth.se

1.5 Course material

Reading and practice (downloadable in Canvas):

- M. Norgren, Guided Electromagnetic Waves (course compendium TRITA-EECS-RP-2020:1)
- Matlab scripts and other material
- Old exam problems

Examples of text books for additional reading:

- J. Van Bladel, Electromagnetic Fields, 2:nd ed
- R. E. Collin, Foundations for Microwave engineering, 2:nd ed
- D. M. Pozar, Microwave Engineering, 4:th ed

1.6 Course disposition

14 lessons, two project supervision sessions, and studies on your own.

2 Examination moments and grading criteria

2.1 Mandatory part

2.1.1 Project work (PROA; 1.5 credits; grades A, C, E, Fx, F)

- Carried out in groups of 2-3 students.
- Project topics will be presented towards end of April. Students may also propose topics.
- For passing grades, all group members must take active part in the presentation.

Grading criteria for the project work:

F Insufficient attempt or failed completion from Fx.

Fx The main subtask carried out incorrectly and/or a poor report.

E The main subtask carried out correctly and properly reported.

C The gross part of the subtasks carried out correctly and properly reported.

A All subtasks carried out correctly and properly reported.

2.1.2 Written exam (TENA; 6 credits; grades A-F)

Consists of four tasks, each centered around a certain topic from the course content, and divided into an (a)-part and a (b)-part:

- (a) To demonstrate conceptual understanding of or prove general principles for guided waves. Marked with $\{a_i = 0 - 5\}_{i=1}^4$ points. Generates exam points according to

$$P_a = \text{ceil} \left\{ 2 \left[\frac{1}{4} \sum_{i=1}^4 (a_i - 1) + \sqrt[4]{\prod_{i=1}^4 (a_i + 1)} \right] \right\}$$

Exam points (P_a)	0-12	13-14	15-20
Grade (TENA)	F	Fx	E

Table 1: Grading criteria for passing the written exam.

- (b) To demonstrate skills in quantitatively solving specific guided wave problems. Marked with $\{b_i = 0 - 5\}_{i=1}^4$ points. Generates exam points according to

$$P_b = \text{ceil} \left\{ 2 \left[\frac{1}{4} \sum_{i=1}^4 (b_i - 1) + \sqrt[4]{\prod_{i=1}^4 (b_i + 1)} \right] \right\}$$

Total exam points ($P_a + P_b$)	15-20	21-25	26-30	31-35	36-40
Grade (TENA)	E	D	C	B	A

Table 2: Criteria for higher grades, awarded if grade E has been obtained in Table 1.

Allowed aids at the written exam:

- Råde & Westergren, Beta Mathematics Handbook and/or Spiegel, Mathematical Handbook of Formulas and Tables.
Other handbooks may be used if approved by the examiner before the writing date.
- Compilation of formulas in electromagnetic theory (from the course home-page).

2.1.3 Students with disability

Information under <https://www.kth.se/en/student/studentliv/funktionsnedsattning>

2.1.4 Completion task

The grade Fx permits one attempt on a completion task to reach the grade E.

- For PROA, the completion task is in the feedback on the report.
- For TENA, the completion task is communicated via email.

2.1.5 Course grade

		TENA				
		E	D	C	B	A
PROA	E	E	D	C	C	B
	C	E	D	C	B	A
	A	D	C	C	B	A

Table 3: The course grade determined from the grades of PROA and TENA.

2.2 Optional part: homeworks

During the course offering there will be four homeworks, handled via Canvas according to the schedule therein.

- By topic area, each homework is related to an exam problem, but wider in scope.
- Marked with $\{h_i = 0 - 5\}_{i=1}^4$ points.
- On the written exam, each a_i -point is replaceable with the corresponding h_i -point.

3 Schedule of course activities

All activities will be held via Zoom at:

<https://kth-se.zoom.us/j/69612279287>

Week	Activity	Content	Chapters	Old exam problems
12	L1	Maxwell's equations. Constitutive relations.	1-2	
	L2	Timeharmonic fields. Field decomposition.	3-4	
	L3	Introduction to metallic waveguides.	5.1-5.3	
13	L4	Waveguide modes in the time domain.	5.4	081217:1, 170316:1 180528:1
	L5	Waveguide modes in the frequency domain.	5.5-5.6	
15	L6	Excitation and power transport.	5.7-5.8	071219:1, 081217:2 170316:2, 180528:2 190604:1, 200528:1a
	L7	Mode scattering and radiation.	5.9-5.10	071219:2 200528:2
	L8	Attenuation of waveguide modes.	5.11	081217:3, 200528:1b
16	L9	Cavity resonators - excitation of modes.	6.1-6.3	170316:3, 200528:3
	L10	Cavity resonators - losses and bandwidth.	6.4-6.6	190604:3
	L11	Introduction to dielectric waveguides.	7.1-7.2	190604:2
17	L12	The optic fiber.	7.3-7.4	071219:5, 180528:3
	L13	Multiconductor transmission lines.	8	071219:6, 081217:4 170316:4, 180528:4 190604:4, 200528:4
18	L14	Catch up and repetition.		
	P1	Supervision of project works		
19	P2	Supervision of project works		
20	PROA	Presentations of project works		
22	TENA	Written exam		

During the course offering, the schedule may undergo minor revisions