Course-Memo, autumn 2019: EI2405 Classical Electrodynamics (7,5 credits)

1 General and administrative

1.1 Course information on the web

https://kth.instructure.com/courses/11264 (in Canvas: specific for this occasion)
https://www.kth.se/student/kurser/kurs/EI2405 (course-plan)

1.2 Service center and student expedition

www.kth.se/eecs/studentsupport
Here you get help with administrative matters.

1.3 Department

Electrical Engineering, Teknikringen 31, floor 4.

1.4 Course responsible, lecturer and examiner

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

1.5 Course material

- J. D. Jackson, *Classical Electrodynamics*, 3:rd ed. (Kårbokhandeln)
- Additional material on the course page in Canvas, including old exam problems

1.6 Course disposition

The learning activities comprise 15 lessons (44 h), combining lecturing theory and solving exercise problems, and studies on your own. In the plan, see page 3, recommended problems from the course book are listed. Some of these problems will be discussed during the lessons; some problems have unofficial solutions available on the web. Problems from the compilation of old exams are labeled yymmdd(problem nr), e.g. 150114(2).

2 Examination moments and grading criteria

2.1 Mandatory part

2.1.1 Written exam TEN1; 7,5 credits

Consists of six tasks, each marked with $\{p_i = 0 - 10\}_{i=1}^6$ points, which together with an optional bonus $B = 0 - 8$ generate the exam score $T = 0 - 68$ according to the formula

$$T = B + \text{ceil} \left\{ 3 \left[\frac{1}{6} \sum_{i=1}^6 (p_i - 1) + \sqrt[6]{\prod_{i=1}^6 (p_i + 1)} \right] \right\}$$

2.1.2 Course grade, determined from the exam score

Exam score (T)	0-28	29	30-35	36-41	42-47	48-53	54-68
Course grade	F	Fx	E	D	C	B	A

2.1.3 Allowed aids

Only the following aids are allowed 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).

2.1.4 Students with disability

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

2.1.5 Announcement of exam results

Within 15 working days the marked exams are returned for re-scanning.

2.1.6 Completion task

The grade Fx permits one attempt for completion to grade E. The completion task is in the re-scanned exam, and shall be submitted within six weeks after the exam result was announced.

2.2 Optional part

2.2.1 Control writing

Consists of three tasks, each marked with $\{p_i = 0 - 10\}_{i=1}^3$ points.
Allowed aids: same as on the written exam, TEN1.
Crediting on the written exam: each task from the control writing replaces a designated task on TEN1, if the control writing task has been given a higher marking. This procedure applies on every written exam occasion before the next course offering.

2.2.2 Home assignments

Four home assignments, marked with $\{p_i = 0 - 2\}_{i=1}^4$ points, which contribute to the bonus score on the written exam: $B = \sum_{i=1}^4 p_i$. The home assignments are handed out and handed in via **Canvas** according to the schedule therein.

Lessons (tentative plan that may be subject to minor revisions)

Week	Content
44	**Green functions in electrostatics** **Expansion methods** (repeat as necessary sections 1.1-1.5, 1.9, 2.1-2.5) Sections 1.6-1.8, 1.10, 2.6-2.8, 2.10-2.11 Problems 1.10, 1.12+1.13, 2.7, 2.13 180112(1)
45	**Expansion methods, cont.** **Electrostatic multipoles** Sections 3.1-3.3, 3.5-3.10, 4.1, 4.4 Problems 3.1-3.3, 3.6-3.7, 3.9-3.10, 3.23(a,b)-3.24, 4.1-4.2, 4.7(a,b), 4.9 091217(1); 101216(1); 111221(1); 111221(2); 121213(1); 121213(2); 140117(1); 140117(2); 150114(1); 150114(2); 160111(1); 170110(1)
46	**Magnetostatics and quasi-magnetostatics** (repeat as necessary sections 5.1-5.4, 5.7-5.8, 5.15-5.16) Sections 5.5-5.6, 5.17-5.18 Problems 5.8-5.9, 5.20, 5.28, 5.32-5.35(a,b) 111221(3); 121213(3); 140117(3); 150114(3); 160111(2); 160111(3); 170110(2); 180112(2)
47	**Wave equation; retarded fields; conservation laws; point charge fields; covariant electrodynamics** (repeat as necessary sections 6.1-6.3, 11.1) Sections 6.4-6.5, 6.7, 6.9, 11.3-11.6, 11.9-11.10, 14.1-14.2
48	Problems 6.2-6.3, 6.5(a,b)-6.6(a), 6.10, 6.12-6.14, 6.21-6.22, 11.13-11.15, 11.27-11.31, 14.3-14.4 091217(2); 091217(4); 101216(2); 101216(4); 111221(4); 111221(6); 121213(4); 121213(6); 140117(4); 140117(5); 150114(4); 150114(6); 160111(4); 170110(3); 180112(3)
49	**Plane waves: reflection and refraction** **Plane wave expansions** (repeat as necessary section 7.1) Sections 7.3-7.4 Problems 7.2-7.5, 7.7, 7.28-7.30 101216(3); 111221(5); 121213(5); 140117(6); 150114(5); 160111(5); 170110(4); 180112(4)
50	**Plane waves in anisotropic and dispersive media** Sections 7.5-7.6, 6.8, 7.8-7.10 Problems 7.16-7.17, 7.19-7.22 091217(3); 160111(6); 170110(5); 180112(5)

Classroom: "Ivar Herlitz", nr 2306, in the entrance at Teknikringen 33.
Problems from the compilation of old written exams are labelled yymmdd(task).

Advices from previous course participants (source: old course questionnaires)

- Previous exams are very important if you want to have a high grade. some knowledge of required math is also very important. Try to focus on course and solve corresponding exam question, don't even have to do the problem of the textbook which I think is time consuming.

- Do all the homeworks they're very worth it What advice would you like to give to future participants?

- Through this course is heavily math-concentrated, after all, it is a physics course so try to understand those long formulas from a physical perspective. Things become much easier that if you think way.

- Attend all the lectures for concepts and the problem class for getting insights on solving problems in different way. Also, practice problems from Jackson to get a strong hold on the subject.

- Try to get as much points as possible on the control writing

- Get familiar with the math ASAP

- Dont let the big GF expansions scare you

- Don't get intimidated by complex equations

- Study the old exam question from the start. There is not enough time to get a complete understanding of everything presented in the class.

- Do not give up at the first part of the course, everything is understandable if you work on it (it can take some time)