Course Analysis

Course data

Course name	**ENERGY AND FUSION RESEARCH**
Course number	ED2200
Course credits (total) and credits for each module	6 hp Hand in assignments (4.5 hp) + mini group works (1.5 hp)
Time for course offering	Period 4, 2024
Course responsible and other teachers	Per Brunsell EECS/Electromagnetic Engineering and Fusion Science
Teaching hours, distributed on F, Ö, R, L, S	24 F + 12 Ö (Notation: F – lecture, Ö – exercise session, R – ”räknestuga”, L – lab session, S – seminar)
Registered students, number	28 students
Performance indicator, after 1 examination offering, %	
Examination rate, after 1st examination offering, %	79 % (22 students)

Course goals

Specify the overall goals for the course	The course should provide insight into how and why fusion energy will be a part of the energy future, as well as give understanding for the basic plasma and reactor physics in current and future fusion power plants.
Specify how the course is designed to meet the goals	The lectures are goal-oriented and they focus on topics relating to the course goals and content. The course requires continual work and is examined on a continual basis from home assignments and participation in mini-group work. Grading: P/F. No final exam is given.

Pedagogical development I

Describe the changes that have been made since the last course round. (Tell the students at the start of the course)	The course book have been updated introducing some minor changes to improve the clarity of the presentation and correcting some misprints in the previous edition.

Student contact

Students in this year's course committee; name and email	We do not employ course committees. The course design has been well developed during a number of years and assessed in surveys, so we do not consider a course committee to be needed. Important instruments for course development are * two written formative questionnaires * informal discussions with the students
Results of formative middle course survey	Not employed.
Results of course committee meetings	Not employed. Integrated course evaluations (weeks 2 and 6) provide helpful information, discussed in the group.

Course evaluation; student viewpoints

Period, when the course questionnaire was available

The course evaluations were open course weeks 2 and 6 and integrated in the course as part of other course assignments.

Typically the students are positive to having integrated course evaluations.

Questions in the questionnaire

New questions were introduced in 2019.
(The previous questionnaire was used essentially unchanged since the start of the course.)
There are both multiple choice questions (4 grades: ++, +, -, --) and free text questions.

Questions 2023:
Most questions are the same in survey 1 and survey 2.
This gives a good picture of the course's progress.
Green-marked: 1st course survey only
Brown-marked: 2nd course survey only

Compulsory

- Is there a good match between your pre-knowledge and the course content?
- Does the course content match your expectations?
- Do the intended learning outcomes help you understand what you should learn in the course?
- Is the course literature adequate?
- Are the most central topics for fusion energy given sufficiently hig priority, you think?
- What do you find most important in this part of the course? (5 options given)
- Looking at the first two weeks of the course, what would you primarily like to learn more about? (5 options given)
- What, in your view, is the major reason that we do not have commercial fusion energy today? (5 options given)
- Looking back at the course, what would you like to have learned more about? (In the last course week we will study alternative fusion schemes, design of a fusion power station, safety and environment as well as costs for fusion).

(5 options given)

- Is the course design well adjusted for your learning in fusion physics?
- Do you prefer lectures with blackboard based presentations (as compared to ppt slides)?
- Is it clear what you are supposed to learn, and to what level, for passing the course?

Optional

- Are lectures and learning activities planned for a good pace in the course?
- Do you like the mix of learning activities (lectures, home assignments, exercise classes, mini group works)?
- Is there an including, friendly atmosphere in this course?
- Do you receive sufficient feedback to see your progress?
- Is the assessment well designed and fair?
- Is it a good idea to integrate this survey into the course?
- Is there anything you would like to change in the course?
- Any additional comment, on the first 10 questions above for example?
- I am a woman/man/other

Response frequency

1:st survey: 82 %, 2:nd survey: 79%

Changes since previous course round	-
Overall impression	The integrated course survey is generally well received by the students.
Positive viewpoints	-It is a very well designed course and I think that the different parts of the course gives us as students the possibility of learning about the subject in different ways -I think it was a good idea to include previous video lectures to look back on for this year's course. -I feel like I am learning a lot with the set-up of the course so far. -I could follow the course due to not having a big load on other courses, since the pace was quite fast and the material was very condensed (understandable given the course design). -I want to stress how useful I found the blackboard explanations in addition to the presentations, enabling us to comprehend the equations. -The Alfvén Laboratory visit was really interesting, I enjoyed the explanations provided during the tour. -I thought it was a great course. In depth and challenging enough that it was interesting but also not an unreasonable workload. I really enjoyed the lectures and they were some of the most enjoyable physics based lectures I've been too. I also thought the mix of group work and home assignments was great because it meant each week you were forced to review the topic, rather than studying at the end for one final exam. -I feel the course is laid out quite well. -Everything is good. -One of the best courses I have taken so far at KTH. -I believe that the course works very well as it is today and I have learned a lot from it. -The balance between topics has been fine. *About integrated course survey:* - Getting a chance to give feedback this early is quite unexpected bu very much appreciated, usually feedback surveys are given at the end of the course, when it is too late to alter anything in the course. -I appreciate being able to register my opinion while the course is still ongoing. -I think it is a good idea as it provides the opportunity for those taking the course to objectively analyse how things have been going so far and allows the course-giver to receive feedback at an early stage so that problems can be solved quickly.

Negative viewpoints	-I want a more deep explanation on particle interaction and the physics behind plasmas. -I would appreciate more clarity on what is expected from us. The first two classes were mostly just talking about the energy situation whereas class four and five got in to quite a lot of theory. I have a bit of a hard time understanding the balance between how much the theory/physics is in focus in relation to societal/practical aspect of energy and fusion. -I believe a more in-depth course about fusion energy research might be a better fit for the programme students. A lot of the content is a repetition of plasma physics and the dispersive media course. Those topics are crucial to cover for people new to fusion, but it makes the course for more experienced students a bit slow. -I would have enjoyed a computer laboratory or home assignment making a computer simulation within one of the studied concepts. I feel like the use of computer simulations is a central part of plasma physics and it would be really cool to simulate transport for example in a plasma. -More focus on deriving some expressions and not pulling them out of thin air. I understand it is a hard subject and time is limited but a bit more would be useful I think. -I think home assignment 3 and the corresponding in class assignment was significantly more challenging than the others so perhaps a little more tutorial help for this assignment or questions available. -I would have appreciated a "heads up" that somewhere in the middle of the course the course material would suddenly become much more difficult and require much more time and energy. -Possibly more review/transitioning through the course topics. -The text of the question can be quite long, with a lot of important quantities mixed in that can be hard to read. I think that these type of longer text questions could benefit from some breaks in the lines in order to make it easier to separate out useful information.
	In the summary below the multiple choice questions answers (++) and (+) are regarded as supporting the statement in the question.
Was the course relevant wrt the learning outcomes?	96% of the students responded that the learning outcomes helped them to understand what they should learn in the course.
Views on preknowledge	91 % of the students answered that there was a good match between their pre-knowledge and course content.
Views on course design	96% of the students replied that the course design is well adjusted for learning in fusion physics.

Views on course material	91% of the students responding to the survey had a positive view of the course literature.
Views on examination	96% of the students answered that the assessment was well designed and fair.
Particularly interesting comment	-I would like to see a deeper explanation of the ILU:s on the course page; it was not clear what kind of course this was, just from reading the available information. It would have been possible to assume that the course mainly concerns fusion power from a societal perspective, and not how fusion power actually works.
Relevant web-links	

Course evaluation; teacher interpretation

Comments	All students answer multiple choice questions in the integrated course surveys. In addition, many students provide detailed and constructive comments that will help improve the course.

Comments from other teachers

What worked well	-
What did not work well	
Suggestions for changes	

Course committee meetings; summary

Student summary	-
Suggestions for changes	-
Link to meeting minutes	-

Final course meeting

Summary	-

Course responsible, summarising comments

Overall impression	The course worked well. The atmosphere in the classroom was relaxed and informal. Students were interested and motivated to learn about fusion energy.
Positive viewpoints	Most students are happy with the course structure and mix learning activities.
Negative viewpoints	Some students prefer more in-depth discussions, and derivations of formulas. It is a difficult balance to cover a broad topic and at the same time provide enough detail.
Views on pre-knowledge	Students are from different programs and have a mix of backgrounds, so the course curriculum is designed accordingly. Various degree of pre-knowledge in physics or electromagnetics is expected.
Views on course design	Students are generally happy with the course structure and mix of learning activities.
Views on course material	Students were generally happy with the course material, but some would like the course book to have more in-depth explanations and derivations of formulas used.
Views on examination	A large majority of the students regarded the assessment as well designed and fair.

Pedagogical development II

How the changes for this course round worked out	The updated course material has been generally well received well by the students.
Changes to be made for next course round	Updates of the course material is planned, with focus on current trends in fusion research.

Other

Comments