

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, 2021
Course responsible and other teachers	Jan Scheffel and Per Brunsell Division of Fusion Plasma Physics
Teaching hours, distributed on F, Ö, R, L, S	26 F + 12 Ö (Notation: F – lecture, Ö – exercise session, R – ”räknestuga”, L – lab session, S – seminar)
Registered students, number	17 students; one did not finish the course
Performance indicator, after 1 examination offering, %	
Examination rate, after 1st examination offering, %	94 % (16 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)	This is the second consecutive year the course is given fully digitally. No major changes were made except for: <ul style="list-style-type: none">• Web links on vector analysis were provided in order to improve pre-knowledge.• A virtual video tour of the EXTRAP T2R experiment is accessible on the course home page.
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Student contact

Students in this year's course committee; name and email	We do not employ course committees. The course concept is well discussed with previous course committees and assessed in surveys, so we do not consider a course committee to be needed. Important instruments for course development are <ul style="list-style-type: none">* two written formative questionnaires (100 % response)* informal discussions with the students
Results of formative middle course survey	Not employed.
Results of course committee meetings	Not employed. Mandatory course evaluations (weeks 2 and 6) provide helpful information, discussed with the group.

Course evaluation; student viewpoints

Period, when the course questionnaire was available

The **mandatory** course evaluations were open course weeks 2 and 6.
Typically all the students favour mandatory course evaluations.

Questions in the questionnaire

New questions were introduced in 2019.
(The previous questionnaire had been used essentially unchanged since the start of the course in 1995.)
There are both **multiple choice questions** (4 grades: ++, +, -, --) and **free text questions**.

Questions 2019-2021:

Most questions are the same in survey 1 and survey 2.
This gives a good picture of the course's progress.

Greenmarked: 1st course survey only

Brownmarked: 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 high 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?
- This is the first time the course is given as an online course. Do you think that the transformation to an online course is well designed?
- 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	100 %
Changes since previous course round	-
Overall impression	Very good. The course is well established. In retrospect, we should preferably have presented the exercise sessions on video, however.
Positive viewpoints	<ul style="list-style-type: none"> - Yes, these surveys gives the teacher a better understanding of what the students know and what they expect, and being able to improve it. They don't take much time to answer but if voluntary most people ignore them. - Yeah I think this is absolutely necessary. - I think it's too early to say. So far I like how the lectures are pre-recorded and the literature is easy to find. - I really like that there are different kinds of examinations, both individual and group work. - I like how you gave a general overview on fusion research. - The course is great.
Negative viewpoints	<ul style="list-style-type: none"> - Yes, it is a good idea, but I would integrate it at little later. It is too soon now to answer some questions properly. - For me, I would find it beneficial for the exercises to either be presented on zoom or done via video recording in addition to the published document on canvas. This as the solution process can be further explained and fleshed out in terms of why/how different solutions are to be found or interpreted etc. - I would like to receive a more detailed feedback on both assignments and group works. I am aware that there a lot of assignments to grade, but if it is somehow possible, it would be very useful. - I think you could improve how physics and mathematical equations are involved. Personally, rigorous derivations help me understand and remember corresponding expressions. I can see that due to the lack of time and amount of topics you want to cover, it is not possible to do that for each equation. Instead, you could try to give more qualitative expressions without using equations. That would be fine, too. - It is really hard for me to answer qualitative questions in the assignments without much opportunity to discuss them both with other students or a TA / lecturer. - We were about 20 students in this class. I have other classes where we were about the same number of students and holding the lectures even via zoom really created a "togetherness" feeling. It is even easier when we are so few. In this course I've never met my class mates... - It would be good to have an opportunity to ask questions directly to Jan and Per or to see a recording of them explaining the solutions.
Was the course relevant wrt the learning outcomes?	About 90 % of the students responded that the learning outcomes helped them to understand what they should learn in the course.
Views on preknowledge	A few students responded negatively here, but it appears that the new links to vector analysis literature has been helpful this year.
Views on course design	The course design was even more appreciated this year. As many as all but one student were positive.
Views on course material	Course literature was appreciated, typically 90 % thought so (as in earlier evaluations).

Views on examination	All students believed that the assessment was well designed and fair (50 % gave top score).
Particularly interesting comment	<ul style="list-style-type: none"> • All students thought that it was a good idea to integrate the survey into the course. As many as 69 % gave top score. • The question whether there is an including, friendly atmosphere is difficult to assess in a digital course. One student said "There simply is no atmosphere if students are mainly working on their own, this has not much to do with the quality of the recorded or written material (as long as assessment is fair, what it is in my opinion), simply because it has no "human component" which can set up an atmosphere or provide much motivation for the topic." • It was remarked by one student that it would be great if a list of variables or the like could be added to the course literature.
Relevant web-links	

Course evaluation; teacher interpretation

Comments	<p>The course round 2021 worked very well apart from two things:</p> <ol style="list-style-type: none"> 1) We should have provided video exercise sessions rather than just referring to solved problems in the literature. 2) It is hard to create an inclusive atmosphere in a digital course - more Zoom interaction with the students would have been helpful here.
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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	Due to the circumstances with the pandemic it was found too awkward to organize a final course meeting.
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Course responsible, summarising comments

Overall impression	The course works fine.
Positive viewpoints	That the digital design plus the integrated course surveys were so well received overall.
Negative viewpoints	There should have been interactive exercise sessions.
Views on preknowledge	Usually sufficient but some students have problems with electromagnetic theory and vector analysis.
Views on course design	As can be seen from the survey results above, the students appreciate the course design with its mix of lectures, home assignments, exercise sessions and mini group works.

Views on course material

The book, written by us, is appreciated.

Views on examination

Continual examination is highly appreciated. This also means that we teachers meet well informed students in class.

Pedagogical development II

How the changes for this course round worked out

- The links to vector analysis literature seem to have been helpful. This year all the students that followed the course passed the examination.

Changes to be made for next course round

- If the course is given physically next year, there are no major things to change. But if given digital, we need to provide live or video exercise sessions.
- A list of acronyms and common variables used in the course could be written.
- We did not find any plagiarism this year, but it is worthwhile to consider how to reduce it generally.

Other

Comments