Course Guide

2024-2025
Master in Energy Science - Period 1

Dr. Matteo Gazzani

Universiteit Utrecht
Faculty of Geosciences

Copernicus Institute of Sustainable Development

Table of Contents

1. GENERAL COURSE INFORMATION

Course information and personnel

Course coordinator and main lecturer
Dr. Matteo Gazzani
Group Energy & Resources
Copernicus Institute of Sustainable Development
Utrecht University
Vening Meinesz building – Room 8.20
Princetonlaan 8a
3584 CB Utrecht
The Netherlands
E-mail: m.gazzani@uu.nl

Teaching Assistants
The teaching assistants are PhD candidates in the group of Energy & Resources – please don't abuse of their availability.

Luca Bertoni, MSc	l.bertoni@uu.nl	Primary TA
Annika Boldrini, MSc	a.boldrini@uu.nl	Primary TA
Zhi Gao, MSc	z.gao1@uu.nl	Primary TA

Introduction and place in the educational program

Energy Conversion Technologies is an in-depth course on conventional, current, and future energy technologies. While in most of the courses of Energy Science (even more in other master programs as "Innovation Sciences" and "Sustainable Business and Innovation") technologies are treated as ***black boxes*** for which some ***input*** is required to produce some ***output***, this course provides insights into ***how*** these technologies work. In other words, it describes the physical phenomena taking place in the conversion system and it provides tools to quantify the performance. In order to do this, the student needs to open up the black box of energy conversion system and study the scientific principles (thermodynamics/physics/chemistry) underlying the considered technologies. By applying basic physical principles, the student will be able to, e.g.: (i) identify the maximum theoretical conversion efficiencies, (ii) the comparison with actual efficiencies, and (iii) understanding where improvements are (still) possible.

When looking at the Energy Science overall program (see Figure 1 below), it becomes clear that ECT provides key knowledge and input for the courses in Periods 2-4, especially Advanced Energy Analysis, Energy Systems Modeling, Energy System Integration, and the Consultancy Project. By giving physics-based insights in energy conversion devices, the course allows the student to zoom out to the system level while knowing the key advantages/disadvantages of the elements and where further development should be targeted. ECT is not the only course in Energy Science with a focus on technologies: it is in fact complemented by Energy System Integration in Period 3, which deals with technologies and systems needed to transition to a net-zero society: electric batteries, grids, hydrogen. After having completed ECT and Energy System Integration you will have a thorough understanding of current and future energy conversion technologies, which are at the core of the energy transition.

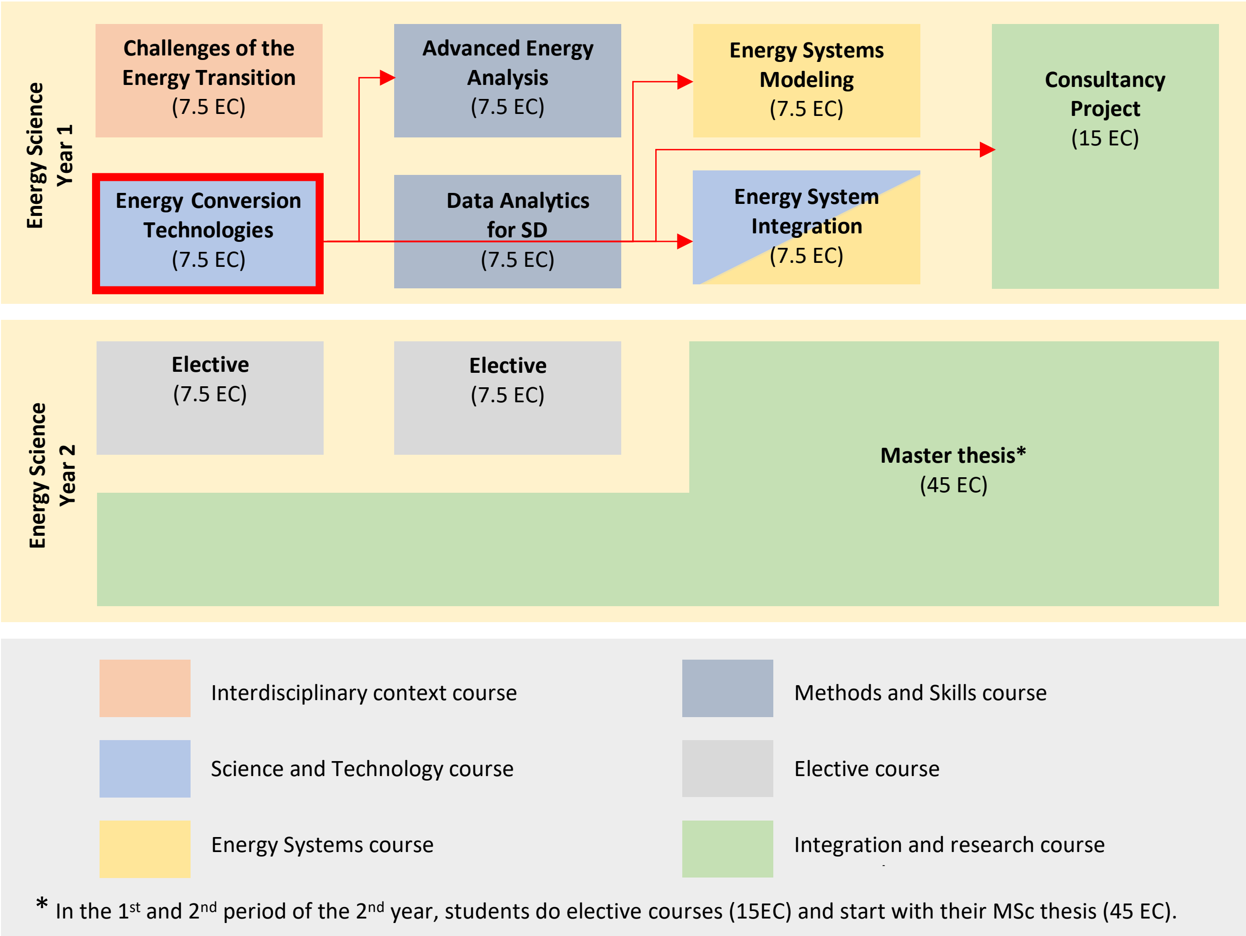


Figure 1: Overview of the renewed Energy Science Master's degree programme.

Required previous knowledge

To succeed in ECT, it is key to possess knowledge in thermodynamics. For this, a bachelor degree in natural sciences, or environmental science is usually required. Moreover, hands-on experience with spreadsheet or programming software will facilitate the solution of the more elaborate problems during exercise classes. More specifically:

Knowledge in Mathematics. While the course will not require advanced mathematical skills, it is expected that the student can handle different type of equations, including resolution of systems of equations, simple differential equations, derivative operation, logarithms, integration, vectors.

Knowledge in Physics: thermodynamics, mechanics, energy mass and force balances, as for example treated in the course 'GEO2-2212 Applied Thermodynamics and Energy Conversion Technologies'.

The student is expected to autonomously close knowledge gaps in prerequisites. Errors in the exams linked to mathematics (e.g. equation resolution) or physics (e.g. simple units conversion) will be treated as knowledge errors. Therefore, the student can very well expect to fail the course if not familiar with simple mathematics and physics.

Entry requirements

All students admitted to the Energy Science master have been judged as fitted for all courses given in the program. The course does not have any specific entry requirements in terms of previous courses (for example for students of non-Energy Science masters) or number of credits. The required previous knowledge is therefore leading.

2. COURSE CONTENT

Program and schedule

ECT deals with the most important energy conversion technologies, including past, current, and future energy systems. The course is divided into three main blocks. The first block deals with thermodynamic-based heat-electricity conversion technologies. The second block focuses on advanced chemical conversion systems. Finally, the third block focuses on non-heat, non-chemical systems. The focus is on the attainable performance and the pivotal parameters that influence the performance and applicability of the energy conversion technologies.

More specifically, the technologies covered in ECT are (small deviations from this list might be introduced if necessary/better for the course):

Block 1: Heat-power systems (week 2-4)

1. Steam cycles (Rankine cycle)
2. Gas turbines (Brayton cycle)
3. Concentrated solar power
4. Refrigeration and heat pumps

Block 2: Chemical systems (week 5-6)

5. Syngas production (hydrogen production and biomass conversion)
6. Carbon dioxide capture, storage, and utilization

Block 3: Cold-physics systems (week 6-8)

7. Photovoltaic panels
8. Wind turbines
9. Hydropower turbines

The analysis of such technologies entails understanding and applying scientific theory/principles from different fields, such as physics, chemistry, thermodynamics, fluid transport, heat transfer, etc, to determine not only the performance of energy conversion technologies, but also the relevant parameters that affect the performance and applicability of energy conversion technologies.

The course (on-campus) activities are scheduled on Monday afternoon and Thursday morning. A detailed program and schedule of the course is available as stand-alone file online with topic, time, mode, room and lecturers. A summary of the topics and timing is illustrated here below.
In the first two lectures, we will review the fundamental thermodynamic and fluid dynamic knowledge, while we will start our journey in the energy technology domain from end of week 2. In week 5 the **midterm exam** is scheduled covering **all topics in the preceding weeks**. In the tutorial before the midterm exam, we will solve exemplary exam questions. In the second part of the course, we will cover chemical and cold-physics technologies. The **final exam covers topics** of the second part (week 6-9). Indeed, concepts used in weeks 1-5 might be needed also for the resolution of the final exam (e.g. efficiency of a gas turbine).

In addition to lectures and tutorials, you will be involved in writing and presenting a short research project. The presentation will take place on Thursday 24th of October (week 8). More details are provided below.

Period 1:	*week 1*	*week 2*	*week 3*	*week 4*	
Part 1	Block 1: Heat to power technologies				
Monday Lecture and tutorial 13.15-17.00	No activities	Fundamentals of fluid dynamics and heat transfer	Brayton cycle and gas turbines	Refrigeration and Heat Pumps	
Thursday lecture and tutorial 9.00-12.45	Introduction, Thermodynamics Refresh, Chemical equilibrium	Rankine cycles	Concentrated solar power cycles	Resolution Mock exam	
	week 5	*week 6*	*week 7*	*week 8*	*Week 9*
Part 2	Block 2: Chemical systems and Block 3: cold-physics system				
Monday Lecture and tutorial 13.15-17.00	No lecture (midterm exam on Tuesday 1st Oct.)	Carbon capture, storage and conversion	PV, technologies and systems	Hydropower systems	Resolution Mock exam
Thursday lecture and tutorial 9.00-12.45	Syngas production from gas and biomass	PV, intro to semiconductor physics	Wind turbines	Research project presentation	No lecture (midterm exam on Tuesday 29th Oct.)

Objectives

The overarching course aim is to provide students with detailed knowledge on the science of energy conversion technologies, i.e. fundamental physical principles and practical aspects of:

- *Heat-to-electricity* energy conversion technologies: traditional (+new) EC technologies
- *Chemical conversion* technologies: CO2/H2/biomass chemical processes
- *Renewable potential-to-electricity* energy conversion technologies: renewables

The objectives of the course are strictly aligned with those of the Energy Science master. Particularly, the course contributes to objectives 1, 2, 3, and 6:
[OB1] The graduate has advanced demonstratable knowledge and understanding of energy technologies and energy systems, including their dynamics and challenges in the context of the energy transition and sustainable development.
[OB2] The graduate is able to conduct research on energy technologies and energy system dynamics and challenges in a creative original and independent way.
[OB3] The graduate has the ability to apply knowledge, research methods, and problem-solving abilities in broader and novel contexts related to energy systems and the energy transition.
[OB6] The graduate is able to communicate conclusions, as well as the knowledge, reasons and considerations underlying these conclusions, to an audience of specialists and non-specialists alike.

The **hard skills** that will be acquired include:

- Quantitative analysis of energy conversion technologies: Mass and energy balances, energy technology performance and other relevant KPIs
- Identification of the necessary level of energy conversion detail: moving through different levels of complexity as needed for energy system modelling
- Identification of research and development gaps for energy conversion technologies

The **soft skills** that will be acquired or further developed include: problem solving, critical thinking, scientific writing, scientific reading, searching and analyzing literature, presentation skills, provide feedback.

Instructional modes

ECT is structured in lectures and tutorials and they should both be regarded as key interlinked components of the course. It is therefore strongly suggested to attend both.

Lectures, which will be mainly given by Dr. Gazzani, are given mainly using black/white board and, sometimes, slides. Attending lectures is therefore important, yet not mandatory, to be fully aware of the specific content and to gain insights not available in the course material. Lectures consist of 2 hours on a specific topic and are followed by tutorials on the same lecture topic.
Tutorials, which last for 2 hours, consist of typically large exercises with different questions. These are representative of close-to-reality problems and allows for developing problem solving attitude and critical thinking. These exercises are typically more difficult than exams questions (but indeed in tutorials you have the solution available). Student can decide two different modes for the tutorial:

- *Group 1*: this group will be in a lecture room, where a teaching assistant will solve the exercise at the blackboard. Accordingly, the student does not solve the tutorial independently, but follow the resolution done by the teaching assistant. It is therefore important that the student repeat the tutorial at home independently. This group is best suited for those that have knowledge gaps and/or those that prefer to learn the resolution strategy used by the teaching assistant.
- *Group 2*: this group will be in a tutorial room and students solve the exercise independently or in small groups. Moreover, a teaching assistant will be present in the room to answer questions related to a specific tutorial. Note that the teaching assistant will not solve the exercise, but provide explanations to specific questions. This group is best suited for those students that prefer to solve the exercise independently (both time and resolution wise), and who want to fully use the tutorials time as mean for the exam preparation. It is also important to note that group 2 and group 1 take place at the same time and that the teaching assistant of group 2 will answer questions related to the provious tutorial, i.e. a student can independently solve an exercise and attend group 2 to ask questions and solve doubts of the previous tutorial compared to the topic of the lecture.

Students can freely move between the two groups during the course, e.g. *n* tutorials in group 1 and *i* tutorials in group 2. Based on historical realization and because of infrastructure limitations, the room of group 2 can host 30-40 students, while the room of group 1 can accommodate all students of the course. Time and location of the two groups are available online under the course information.

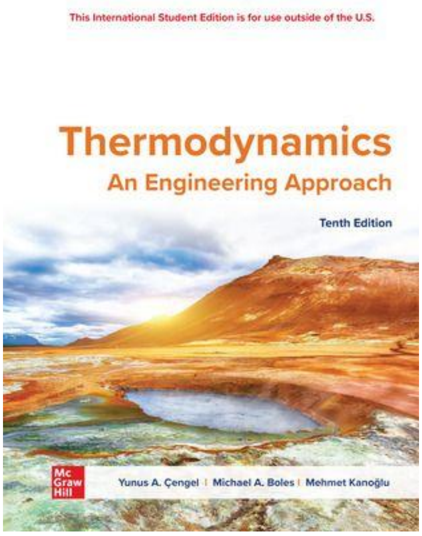
Generally speaking, UU-*bring your device* concept applies to ECT. For successful participation in the exercise classes you are advised to prepare for each session by studying the material indicated in the last paragraph of this course guide.

Changes to the course for academic year 2024-2025

Following the renewal of Energy Science, this course is new and builds upon to a good extent on the integration of the previous ECT-1 and ECT-2.

Study material and digital material

Because of the number and diversity of topics, this course does not have a single book but a more complex list of material. In general, the course material consists of (i) lecture notes, (ii) course reader, (iii) course book and book sections, (iv) exercises (and answers), and (iv) additional material.



In more details:

Lecture notes: mainly hand notes of Dr. Gazzani used during the lectures. These are uploaded on the course website after each lecture.

Book for block 1: *Thermodynamics, an engineering approach*, 10^{th} Edition, by Y.A. Çengel and M.A. Boles (see below for purchase options and discount by McGrawHill). You can also use the 9^{th}, 8^{th} or 7^{th} edition. This book is also very helpful in freshening up your skills in thermodynamics and filling the gaps due to differences with previous courses on thermodynamics that you may have followed. The book furthermore treats the laws of thermodynamics for control masses as well as control volumes, treats various power cycles (gas turbines, Otto and Diesel engines, steam cycles, etc.), heat pumps and refrigeration etc.

Book sections are available for certain topics.

Course reader: The reader contains material for block 2 plus additional content (e.g., fuel cells, electric/hybrid cars, heat integration, thermochemical conversions, carbon dioxide capture & storage, and hydrogen technologies). A digital version of the reader is available for free on blackboard, but printing has to be independently arranged for. The edition from 2022-2023 and 2023-2024 can be used for this year, but additional corrections, if needed, will be only added to the current version.

Additional material: additional material will be available on the course website.

Given that the course material is allowed at the exam, it is suggested to have a hard copy of them (i.e. not digital). You can check with the student associations NRG, Storm or Helix for availability of the books with discount or second-hand.

Study load

See table below for a distribution of the course hours. Self-study hours are calculated using 2 hours per hour of lecture and tutorial, plus 15 hours of preparation per exam, plus 2 hours for preparation of the minisymposium presentation.

Contact hours with classroom reservations	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Total
Lecture	4	4	4	4		4	4	2		26
Tutorial/(computer) practical/workshop /seminar		4	4	4	3	4	4	2	3	28
Exam, preliminary examination, computer test					2.5				2.5	5
Other, e.g. presentations								3		3
Total contact hours										62
Self-study hours	9	16	16	21	18.5	16	16	17.5	18.5	148.5
Total study load										**210.5**

3. TESTING AND ASSESSMENT

Exams

The course will be assessed on the 1-10 scale on the basis of the following parts:

- Midterm exam (X_1) 40%
- Final exam (X_2) 40%
- Research Project Proposal (X_3) 20%

Written Exams
The midterm and final exam will be written exams. The two exams will take place as following (check schedule on mytimetable or Blackboard for any update):

1. Tuesday 1st of October, 13:30 – 16:30 in Educatorium Beta.
2. Tuesday 29th of October, 13:30 – 16:30 in Olympos Hal1.

The exams will consist of open questions. The exams are *open book* exams but restricted to the course material and your own handnotes. Therefore, you are allowed to use the textbook of this course (Cengel and Boles), the course reader, additional material on the course page, the lecture handnotes available online. You are allowed to have other notes (e.g. your own notes), but not other books. In addition, you can use a (graphical) calculator (make sure it has fresh batteries), not the one on your cell phone. No other electronic material is allowed at the exam.

On Blackboard you can find exams of previous years together with answer models. Please note that the course is new, therefore the exams will not be fully representative; however several questions may be relevant. Please be critical when using these exams to assess your preparation (e.g. if you solve an old exam with no errors, this does not mean that you are going to get 10 in the official exam, but that you are probably well prepared – in other words self-assessment does not count in the final grade).

Every student is expected to actively participate in this course. Active presence at lectures and exercise classes is not a guarantee for passing the exam but it will surely help studying and understanding the course topics. The exams will consist of 3 or 4 problems, which will be different, but overall slightly simpler than the exercise classes (they will be solvable in the given exam time). Note that the theory and methods treated in this course enable application to a wide range of energy conversion processes, so you will also **be able to apply these tools to other conversions** than you may have seen in the exercises or in earlier exams.

Research Project Proposal

In addition to the written exams, you are requested to write an executive summary of a research project proposal. This consists in one A4 page (it should be limited to maximum 4000 characters) which provides a concise, yet clear overview of a possible research project. The executive summary should contain: an introduction/background with purpose and context, a research problem objective, the approach/methodology that should be used to conduct the research, and the impact of the project (importance and outcomes). In addition to the 1-page document, the research project proposal has to be presented in a 5-minutes presentation pitch, which will take place on October 24^{th}. The executive summary and the presentation contributes both to the final grade, as they are integral part of the assessment.

This activity will be carried out in a group of two students. Groups will be formed by the course coordinator to account for diversity in general. The choice of the research topic is free as far as it is related to the technologies investigated in this course (other technologies, e.g. electric batteries are not eligible).

The short research project proposal will be graded by one staff member and peer-reviewed by another group: the grade is composed of 2/3 of the staff member's grade and 1/3 of the grade given by two fellow students (i.e. another group). E.g., group A is graded with an 8 by the teacher and by a 7 by two fellow students (another group). The final grade for the research project will be (2/3)*8 + (1/3)*7.

Rules during an examination

The specific set of rules will be reported on the exam text. It is of the utmost importance that you can identify yourself during the exam. This means bringing and showing your ID card with photo. If you cannot show this, you may be excluded from the exam. Some additional rules during an exam:

- You may not leave the room during the first 30 minutes of the exam.
- Latecomers will be admitted only until 30 minutes after the start of the exam.
- All electronic equipment needs to be switched off (including phones and smartwatches!), except for equipment which the examiner has allowed.
- Put coats and bags on the floor. Bags need to be closed.
- If you need to use the toilet, inform an invigilator.
- Raise your hand if you have questions, if anything is unclear, or if your need extra paper etc.

You can find further instructions on the examination paper. Always follow these rules.

Assessment

The final grade (FG) will be calculated as:

$FG = 0.4X_1+0.4X_2+0.2X_3$

where X_1 is the result of exam 1 (midterm), X_2 is the result of exam 2 (final exam), X_3 is the research project proposal result.

Final course grade: The final course grade will be satisfactory (pass) or unsatisfactory (fail) and will be expressed in numbers of 6 or higher and 5 or lower, respectively. The final grade will be rounded off to one decimal place (e.g. 7.4 or 8.7). A final course grade of 5 does not have any decimal places; an average grade of 4.50-5.49 is unsatisfactory, an average grade of 5.50-5.99 becomes a 6.0. The figure below summarizes the grading procedure at the Faculty of Geoscience.

If you have fulfilled all course obligations but failed to obtain a final grade of 6 or higher, you will be given one chance to repair, via a supplementary test ("aanvullende toets"). If the supplementary test has been passed, the final grade of the course will be 6.0. According to the Teaching and Education Regulations, you also have the right to a supplementary test if you have not fulfilled the minimum grade (5.50) of no more than 1 partial test, even though your final non-rounded grade is 5.50 or higher. If that supplementary test has been passed, it will count as a 5.50 when calculating your new final grade. This course does not have a minimum grade requirement for a partial test.

Note that a non-rounded-off final grade <4.00 implies a definite fail, i.e. in such cases there is no right to a supplementary test nor to a supplementary partial test.

The table below indicates the cases resulting in a supplementary (partial) test for this course. Partial grades (for the exams and minisymposium) expire at the end of the course year.

overall course grade FG $0.4X_1+0.4X_2+0.2X_3$	
≥ 5.50	passed
≥ 4.00 and < 5.50	REPAIR written exam
< 4.00	No REPAIR allowed

The supplementary test will cover all course material in case both regular exams are insufficient. In this case, students will be offered the possibility of solving a written exam containing 3/4 bridging exercises on the whole course. If a student fails only the midterm or final exam, the supplementary test will cover only the insufficient topics. In all cases the exam will take place at the same day/time (2.5 hours for full exam, 1.25 hours for partial exam).
As an alternative, students can opt for an oral repair exam, where exercises and theory are discussed directly with the course coordinator. This solution is suggested in case of multi-years failure with the course, and not recommended for new students (as failing a course multiple times is detrimental for the student career, the coordinator prefers to have an oral dedicated test, that typically allows for a deeper evaluation).

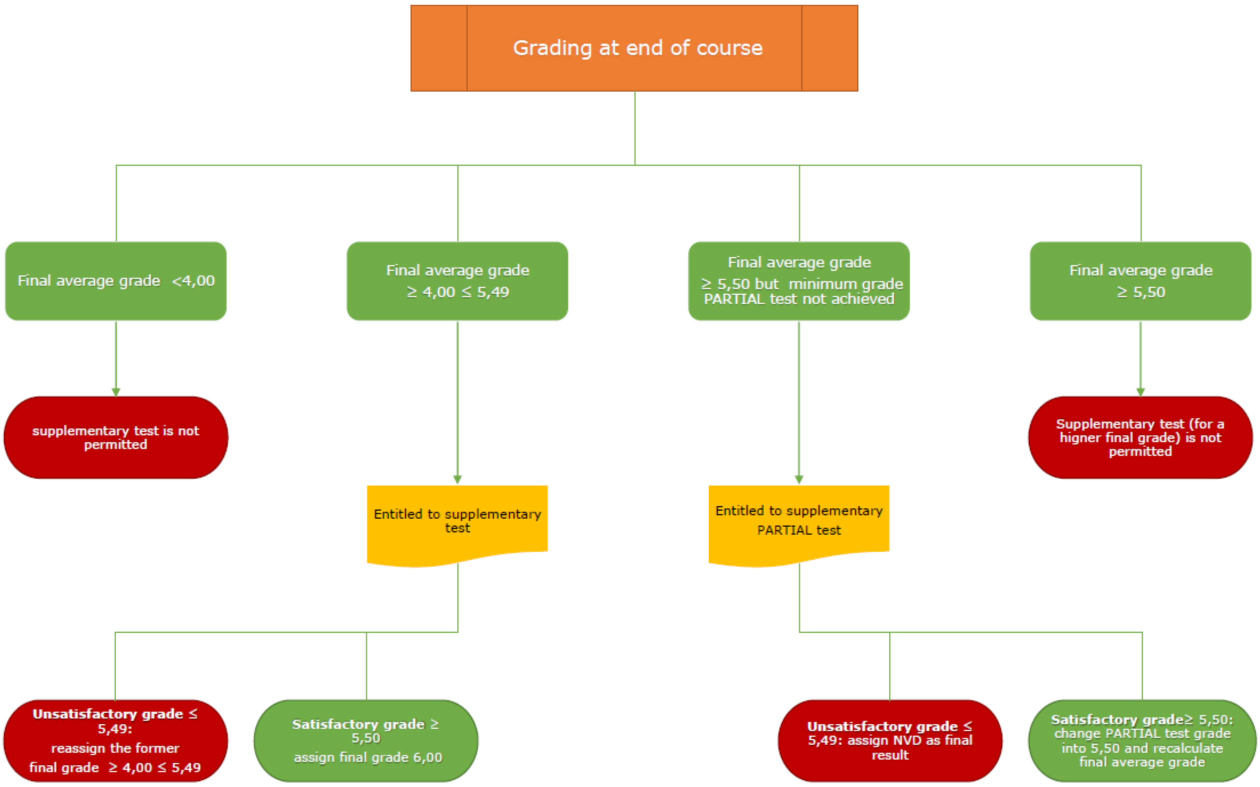


Figure 2 – Procedure for the course grading

In case of absence during the mandatory tests (see below for related reporting procedure), a replacement test ("vervangende toets") is applicable under demonstrable circumstances beyond your control (such as serious illness[1], unplanned public transport disruption).

The table below shows the regular procedure for assessment in case of absence at one or more exam session.

Exam	*Absence*	*Assessment*	*Consequence*
Midterm exam	Yes	Via the replacement test, carried out with the repair exam	Student can attend the final exam, which will count for the second part of the course, X_2
Final exam	Yes	Via the replacement test, carried out with the repair exam	Midterm exam will be considered in the final grade as X_1
Research proposal pitch	Yes	Rescheduled presentation	Contact the coordinator for a new time

As shown, in case of absence during one of the two regular exams, the student will have to take the replacement test, which coincides with the repair exam. The student will be asked to solve only the exercises relevant for the missed exam. Time will be adjusted accordingly (i.e. 1.25 hours (75 min) instead of 2.50 hours (150 min) when doing either the midterm or final exam replacement). Note however, that a perfect distinction between the two parts of the course is

[1] You must be able to prove that, e.g. with a certificate from you general practitioner if necessary. Cases of sudden headaches, physical distress as consequence of party/relocation/noisy neighbors or roommates, or any other physical condition that cannot be proven won't be considered as valid absence circumstances.

not possible in a repair exam, which has to cover all program. Accordingly, the student might need to use concepts from both the first and the second part of the course when solving the replacement test.
Statistically, it is better to attend the two regular exams. Therefore, try to do your best to not miss the tests, even in the case of disruptions/light sickness. Absence or illness does not relieve you of your obligation to perform to the best of your ability. If the quality or quantity of your attendance has been insufficient, the course coordinator may exclude you from the remainder or part of the course.

Attendance and effort requirements

Attendance is compulsory neither for lectures nor tutorials, but only for examination.

Procedure reporting absence students
If you cannot attend a mandatory exam due to serious illness or other reasons beyond your control, mandatory attendance will not apply. You must be able to prove that the reason for absence was beyond your control, if the course coordinator asks you to do this. Ultimately, the course coordinator will decide and approve this.
Absence must be announced via the webform: (https://fd21.formdesk.com/universiteitutrecht-geo/AbsenceForm) which can be found on the students' website or via the link on the Blackboard community of your programme. The student does not need to send an additional email to the course coordinator.

Absence or illness does not relieve you of your obligation to perform to the best of your ability. In other words, if you have not been able to complete an assignment contact the course coordinator to find out whether it may be rescheduled to another date.

If the quality or quantity of your attendance has been insufficient, the course coordinator may decide that you no longer have the right to sit a supplementary test ('repair exam'), and/or impose other sanctions. The full policy can be found in the Blackboard community of your programme. The Department of Sustainable Development uses, amongst others, the following sanctions:

Handing in late or not at all	Text too long	Presentation too long
Work that was handed in late is considered as not submitted. You can inform the lecturer about any special circumstances and the lecturer decides on the sanction.	≤5%: -0.5 point 5.1-10%: -1.0 point 10.1-25%: -2.0 points 25.1-50%: -3.0 points >50%: -4.0 points and no right to supplementary test	≤5%: -0.5 point 5,1-10%: -1.0 point 10.1-25%: -2.0 points 25,1-50%: -3.0 points >50%: -4.0 points and no right to supplementary test

In this course we will follow the rules as written above for 'Handing in late or not at all', while we will apply the remaining ones with a grain of salt.

NOTE! If you do not submit your work or submit it too late, and the teacher determines that there are no special circumstances in your case, this means in practice that you will receive an NVD (Niet VolDaan; Incomplete). As a result, you cannot receive a final grade and you will not have passed the course. Therefore, make sure that you always hand in something (on time!) that can be assessed or contact the coordinator.
Students always have two chances to pass a test. If the final grade of a course before rounding is between 4.00 and 5.50, there is a right to repair (a supplementary test). This is also the case

if there has been a replacement test. Students that are absent due to circumstance beyond their control will have the right to one replacement test – see above. If the student is absent at the replacement test as well, the right to a replacement test expires (as stated in the Teaching and Examination Regulations - OER). In case of dispute, reference is made to the Teaching and Examination Regulations (OER) of the degree programme and the Regulations of the Board of Examiners.

Group work

There is an effort requirement for groupwork. Insufficient contribution to groupwork (or 'freeriding') can result in sanctions. In case a group member does not contribute sufficiently, it is the responsibility of the other group member to address this within the group and to inform the course coordinator in time. Eventually, whether a student has sufficiently contributed will be decided by the course coordinator.

Studying with disabilities, physical and/or mental impairment

The Copernicus Institute of Sustainable Development tries to meet the needs of students with a disability, physical and/or mental impairment as much as possible by offering facilities for their studies. However, students play an active part in this as well. Only students who have a contract with the department are eligible for facilities and special regulations. Students with a contract will be registered in OSIRIS. The lecturer can see which students have special facilities (and what kind of facility) in OSIRIS. If you think you are entitled to a facility which is not yet mentioned in OSIRIS, please contact the study advisor. Do this well in time, well before the first test takes place.

4. FRAUD AND PLAGIARISM

You are always expected to hand in your own authentic work. Discussion with others can be enriching but the final product always has to be your own. All scientific research, including that of students, builds on the results of the work of other researchers, either in a positive or in a negative sense. Those other researchers deserve the credits for their work, in the form of a correct acknowledgement.

In short, quoting is allowed (and even necessary), but copying other researchers' work (including that of AI software such as ChatGPT) and presenting it as if it were one's own is plagiarism: unacceptable behaviour in the world of science. Lecturers have software to check texts for plagiarism and they will apply this software. Students who plagiarise run tremendous risks: in the worst-case scenario they will be expelled from the programme for a year. More details about the sanctions involved in plagiarizing can be found in the Teaching and Examination Regulations of the programme:
http://students.uu.nl/en/practical-information/academic-policies-and-procedures/regulations

More information about fraud and plagiarism can be found here:
http://students.uu.nl/en/practical-information/academic-policies-and-procedures/fraud-and-plagiarism

On the website https://www.wix.com/wordsmatter/blog/2020/02/ways-to-avoid-plagiarism/ you can find tips on how to avoid plagiarism.

Fraud and plagiarism are defined as an action or failure to act on the part of a student, as a result of which a correct assessment of his knowledge, understanding and skills is made impossible, in full or in part.

Fraud includes:

- cheating during tests. The person offering the opportunity to cheat is an accessory to fraud;
- share answers with others while taking a test;
- seeking the help of third parties during a test;
- being in possession of (i.e. having/carrying) tools and resources during tests, such as pre-programmed calculators, mobile phones, smartwatch, smartglasses, books, course readers, notes, etc., unless consultation is explicitly permitted;
- having others carry out all of part of an assignment and passing this off as own work;
- The course coordinator specifies in the course guide whether and to what extent the use of software such as generative artificial intelligence is allowed in a course or for an assignment. Under no circumstances are students allowed to use software such as generative artificial intelligence to generate (part of) an assignment and submit this as their own work.
- gaining access to questions or answers of a test prior to the date or time that the test takes place;
- perform (or try to perform) technical changes that undermine the online testing system;
- fabricating survey or interview answers or research data;

Plagiarism is defined as including data or sections of text from others/the student's own work in a thesis or other paper without quoting the source. Plagiarism includes the following:

- cutting and pasting text from digital sources such as encyclopaedias and digital publications without using quotation marks and referring to the source;
- cutting and pasting text from the internet without using quotation marks and referring to the source;
- using excerpts from printed material such as books, magazines, other publications and encyclopaedias without using quotation marks and referring to the source;
- using a translation of the abovementioned texts without using quotation marks and referring to the source;
- paraphrasing of the abovementioned texts without giving a (clear) reference: paraphrasing must be marked as such (by explicitly linking the text with the original author, either in text or a footnote), whereby the impression is not created that the ideas expressed are those of the student;
- using visual, audio or test material from others without referring to the source and presenting this as own work;
- resubmission of the student’s own earlier work without source references, and allowing this to pass for work originally produced for the purpose of the course, unless this is expressly permitted in the course or by the lecturer;
- using the work of other students and passing this off as own work. If this happens with the permission of the other student, the latter is also guilty of plagiarism;
- in the event that, in a joint paper, one of the authors commits plagiarism, the other authors are also guilty of plagiarism, if they could or should have known that the other was committing plagiarism;

- submitting papers obtained from a commercial institution (such as an internet site offering excerpts or papers) or having such written by someone else, whether or not in return for payment."2

Fraud and plagiarism in groupwork
In case of group work, the group as a whole is responsible for the work that is handed in. If one of the group members commits fraud or plagiarism, the work cannot be assessed and the whole group will be called in front of the Board of Examiners. If the Board of Examiners determines that fraud or plagiarism has been committed, an appropriate sanction will be determined for each group member separately and the work will be declared invalid. If group members not guilty of the fraud or plagiarism want to receive a grade, the product will have to be re-written in such a way that a plagiarism-free work can be assessed. Make sure you are aware of your team members' work. Check each other's work and call attention to someone's work if necessary. Naturally, you can also inform the course coordinator or another lecturer in the course.

5. QUALITY ASSURANCE: COURSE EVALUATIONS AND COURSE FEEDBACK GROUP

Course evaluation

Each course is evaluated afterwards by the students. The lecturer proposes measures for improvement based on the evaluation results. It is important to fill in the evaluation questionnaire seriously because the evaluation results and lecturer's recommendations are discussed in the education committee and the management team. The evaluation results will be published in the Blackboard community 'Course evaluations Geosciences'. If you cannot log on to that community, and you would like to know the results, you can ask the lecturer for a copy of the evaluation results.

Course feedback group

A course feedback group (CFG) consists of a group of students in a course and serves as a point of contact for fellow students and the lecturer during the course. Its purpose is to find out during the course what is appreciated, what is going well and what practical issues can be improved within the limits of the course coordinator. Please remember that this does not concern aspects which have already been determined, such as the choice of literature, set-up of tutorials or class times (note that rooms are not planned and scheduled by the course coordinator, and can hardly be changed). Course feedback groups are about fine-tuning; for example: are the slides or the hand writing readable, can everyone hear the lecturer, and has information been put on Blackboard on time. The CFG should not be confused with the regular end-of-course evaluation.

Examples of questions for discussion:

- What is going well in the course? What do you like about the course?
- How can the quality of the lectures/tutorials be further improved?
- How can the organisation of the lectures/tutorials be further improved?

[2] Education and Examination Regulations 2024-2025 Faculty of Geosciences, Utrecht University, 25 June 2024

- How can the quality of the slides and/or the information on Blackboard be further improved?
- Does the lecturer explain the literature well enough? Both content and presentation.
- Is it possible to communicate with the lecturer outside class hours?

Or any other similar issues students may have.

Such a group consists of 4-5 students per course who discuss with the lecturer during the break how the course is going. The names of the students in the course feedback group of this course will be posted on Blackboard. The course feedback group and the lecturer will meet during the break of lectures, at least twice during the course.

6. SUGGESTED INITIAL READINGS

Suggested reading material from the book and the reader. For simplicity, in the following we refer to '*Thermodynamics, an engineering approach, 7th, 8th or 9th Edition in SI Units, by Y.A. Çengel and M.A. Boles (McGraw-Hill)*' by using '*Thermodynamics, an engineering approach*'.

Introduction to the course

Reader Chapter 1 "Energy and Energy Conversions"

Optional reading

J. Twidell, T. Weir, "Renewable Energy Resources", Review 5: Units, labelling and conversions: the 'algebraic'method, pp. 728-731.

Thermodynamics principles

STRONGLY SUGGESTED: *Thermodynamics, an engineering approach* Chapters 1-7. Check these chapters and revise appropriate parts to make sure you have the necessary background in thermodynamics at the beginning of the course.

Thermodynamics, an engineering approach Chapter 8 (Exergy). This topic can greatly help in understanding energy use and energy 'losses'.

A.V. da Rosa, "Fundamentals of Renewable Energy Processes", Chapter 2, Sections 2.1 – 2.15, Chapter 3, Sections 3.2 – 3.3.

E. Nieuwlaar, M. Gazzani, Applied Thermodynamics and Energy Conversions, Course GEO2-2212, 2018. [available on request]

H.D. Young, R.A. Freedman, "University Physics", 14th Edition, Addison-Wesley, 2015, Chapters 18-20.