Reports in FYS2160 2023

Here we will try to describe what the objectives are for you learning, how the teaching is intended to support your learning and how we can assess what you have learnt. In the end we will discuss assessment, the type of reports you are expected to write and how they will be judged. During the semester there are 2 lab reports and 3 oblig reports that obligatory.

I. INTRODUCTION

For many years we have included experimental work and computations in the course in addition to traditional (analytical) problem solving. On exams, however only the latter has been included. Starting in 2020, we changed the form of the exam to better reflect the full breadth of skills and ways of using thermodynamics and statistical physics. Due to chatGPT we will no longer use the home exam format, but we will use the report form for obligs and labs to teach more than analytical calculations.

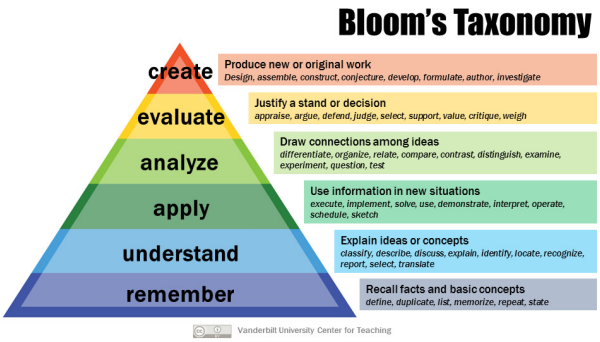
II. THE CORE OF THERMODYNAMICS AND STATISTICAL PHYSICS

The curriculum of this course covers statistical mechanics in the micro-canonical, canonical and grand canonical ensemble and all the basic thermodynamics of closed and open systems. In addition the student should be able to

- define the thermodynamic system (macro) and how it interacts with the surroundings
- analyse statistical mechanical models (micro) and derive thermodynamic quantities (macro)
- translate the understanding of the thermodynamic system into a macro-model
- describe the macro model with equations and boundary conditions
- use the equations to numerically and analytically analyse the micro- and macro-models of the system
- use experimental or numerical data for the system to choose models and fit the model parameters
- draw conclusions about the relation between the micro- and macro-models and our knowledge (experimental, numerical,...) about the system.

This demands a lot of knowledge and many technical skills, but the core is *the synthesis* that corresponds to the upper levels of the pyramid of Blooms taxonomy.

III. BLOOM'S TAXONOMY, TEACHING AND ASSESSMENT IN THIS COURSE



The pyramid above describes the successive actions (or cognitive processes) that you employ when learning.

- Reading the textbook and compendium and listening to lectures you work on remembering and understanding the curriculum.
- The group sessions are intended to help you understand the concepts and connections.
- Solving stringently formulated problems in the weekly exercises you apply your knowledge.
- This is as far as most BSc courses aim and they often teach you to apply very advanced analytical mathematical techniques to difficult but well formulated problems. The objective of this course is to also reach the three top levels of the pyramid that we in short called *"the synthesis"*.
- In order to train you in analysing and evaluating we try to have problem oriented physical lectures.
- The labs and the obligs are formulated in such a manner that you need to analyse and evaluate the problem before you decide which methods or models to apply. You are explicitly asked to draw connections, justify your choices and a good lab or oblig should give you the possibility of producing original solutions.

In short, we try to give you training throughout the pyramid and therefore we find it natural that the assessment should cover the whole pyramid as well.

IV. TRAINING AND TESTING

During 2020 we and many other teachers got new experience with what can be tested during home exams and

not. We expected and even encouraged students to collaborate and discuss during the home exam and we have followed chat pages and interviewed students about how they collaborated. The most striking result is that traditional exam problem formulation is easily shared and copied and therefore is worthless as a test of student skills and understanding. When problems are formulated in an exact manner such that there is only one way to solve the problem by a clear path of analytical calculations almost all students will recognise (or trust) that this is the correct answer when it is shared by other students.

We believe that the top of the pyramid in Blooms taxonomy should be part of this course at the end of the BSc education. We have thus chosen to train your ability to analyse, evaluate and create (the "synthesis skills") by posing problems in a less rigorous manner that is more open to interpretation and different ways of "solving" the problem. Presenting the problem solving strategy, results, discussion and conclusions in a report form also makes it transparent if you copy/paste from other student's work. An added benefit for the student is that both the problem formulation and the report form are closer to real world situations in their future work as physicists.

V. OBJECTIVE OF REPORTS AND EXAM

Reports and exams have a common objective: to document your understanding, knowledge and skills in the subject. Based on this documentation we give you a grade in the course. On the reports you will get pass or fail plus comments in the reports, on the exam you will get a grade from A to F.

The reports have another objective as well: Aiding your learning. By presenting your work in a report you are forced to be stringent and logical in combining the different pieces of text, figures, equations, etc. The process of doing this is intensive learning.

VI. STRUCTURE OF REPORTS

After feedback from students and discussions with the student representatives we have decided to reduce the formal requirements of a report to a minimum. The point is not that you spend a lot of time on formatting and typesetting, but that you spend time thinking, discussing and doing physics and that you present this process in a report as efficiently as possible.

A. Requirements

Document your answer to questions, calculations, analyses, discussions, conclusions, etc. in one single, coherent "report" with the following requirements

- include both experiments, analytical and numerical work in the same report
- the report should have the following parts
  - "Introduction"
  - Main body. This includes (methods,) results and discussion, but you may subdivide the text in any way you find best.
  - "Summary" or "Conclusions"
- there should be a red thread through the report connecting the different parts. This should be established in the Introduction. The results should be discussed in relation to the red thread and in the end you should summarise the relations between the different parts of the study and how they relate to the red thread.
- you may write by hand or use any typesetting system you like, but the report and all figures and labels should be easily readable.
- the report should be a single PDF file.

B. Details that matter

- do not copy text, lists of equipment and units and procedures and method descriptions from the texts given to you.
- All symbols must be defined in the text unless they have been defined in the text given to you.
- All equations, figures and tables must be described in the text.
- All figures must use fonts and symbols that are large enough to be legible (minimum 9pt fonts).
- All but dimensionless numbers must be given with the right units.

VII. CONCLUSION

In order to test the entire set of knowledge and skills that we want students to learn, we have chosen the format of obligs and labs with relatively open problem formulations and answers to be delivered in a simplified report form.