Weekly workload: AMA4004

MathsNET
A joined up approach to
teaching and learning
mathematics

At the start of the semster you should buy yourself a hardback notebook to keep your notes inside. Stick the pages of this guide into the first few pages of your notebook and **make sure that you bring your notebook to all classes and tutorials**. Similarly buy a usb memory key or create a folder on a cloud service such as google drive or dropbox and use this to store all the word processed reports and python notebooks that you write for this module together with the feedback I provide on these assignments. If you have a laptop or tablet please feel free to bring it to all tutorials, lectures and computer classes. If you have this with you it will allow you to access the resources on my website and other online resources.

All the reports that you hand in to be assessed for this module should:

- Have your name written in the top right corner of the first page - if your name is not written on your assignment you will be awarded a mark of zero.

- Be word processed - hand written assignments will be awarded a mark of zero.

- Be free of spelling errors and basic grammatical errors - use a spell checker and/or a grammar checker (see www.grammarly.com for a free grammar checker)

AMA4004 is a 20 CAT point module and as such you are expected to work for 200 hours on this module. Over the course of twelve week semester this works out at about 16 hours per week. Subtracting from this the five contact hours a week you have for this module leaves 11 hours per week that you are expected to spend doing self study for this module. The following sections detail what I recommend you spend those 11 hours in each week working on. Lastly, notice that the conceptual equivalents for a 2.1 at level 3 state that your work must provide:

> Synthesis/integration of material from other modules/experience as well as the current module, well-developed arguments with evidence of independent thought and evidence of wide and relevant use of learning resources

This is thus the main thing I am looking for when I mark the portfolio and report assignments for this module. The assessment for this module includes the following components:

- A 40 minute class test on classical thermodynamics , which counts 10 towards you final module mark and which is due in at Friday of week 3

- One portfolio of work done during the semester , which counts 20 towards you final module mark and which is due in at Tuesday of week 12

- One presentation and report on a scientific paper. , which counts 20 towards you final module mark and which is due in at Fridays of weeks 10 and 12

- One three hour examination in which all questions on the paper must be answered , which counts 50 towards you final module mark and which is due in at April exam period

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A recommended work plan for the weeks that follow is given on the following pages

Week 1

Work through the first half of the videos on the mathsNET website. Try to get to at least the video on the first and second law of thermodynamics.

What we will be doing in the tutorial: During the classes this week you will be asked to give presentations on topics that you will have studied elsewhere during your degree.

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 2 .

Week 2

By the end of the week you should have worked through all of the videos on the mathsNET website on thermodynamics.

What we will be doing in the tutorial: During the classes we will be working through problems on the Carnot cycle and the first and second laws of thermodynamics

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 3 .

Week 3

You should spend the week preparing for the class test. The best way to do this would be to attempt one of the essays on the thermodynamic potentials. This essay can then be handed in as part of your portfolio.

What we will be doing in the tutorial: During the classes we will work on problems involving response functions and Maxwell relations in preparation for the Friday test.

What work should I be handing in this week: Class test on Friday of week 3 , which is due on During Friday class of week 3 . Half page report for portfolio , which is due on 16:00 on Tuesday of week 4 .

Week 4

By the end of the week you should have watched all the videos on the applications of statistical mechanics. You should also begin to attempt the the programming task. By the end of the week you should be able (at a minimum) enumerate all the states of your lattice system, caculate the partition function and calculate the ensemble average fr the energy.

What we will be doing in the tutorial: The classes are an opportunity for you to ask for help with the programming exercises. You will need to work through these to complete the assignment on lattice systems.

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 5 .

Week 5

You should continue to work on the programming task. Try to write up your report on the lattice system as you work through the various tasks. By the end of the week you should have (at a minimum) completed everything up to including calculating the histograms.

What we will be doing in the tutorial: Again the classes are primarily an opportunity for you to ask for help with the python/blockly exercises this week.

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 6 .

Week 6

You should have completed your report on the lattice system by the end of the week. Try to have this done by the end of week 6 even though it is not due till week 12. If you finish this early and you wish to try some of the other programming problems on the website or a programming project or your own design please do so.

What we will be doing in the tutorial: Once again the classes are primarily an opportunity for you to ask for help with the python/blockly exercises this week.

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 7 . One report on simulating a lattice system , which is due on (recommended) Friday of week 6 .

Week 7

You should try to understand all the material on the generalised partition function by the end of the week. To do this watch all the videos up to the one entitled the partition function for molecular gasses. I would then recommend that you try the first essay listed on the extend page for this chapter. This essay can form part of your portfolio.

What we will be doing in the tutorial:

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 8 . First essay on extend page in statistical mechanical theory chapter , which is due on (recommended) Friday of week 7 .

Week 8

You should try to understand all the material on the various thermodynamic ensembles by the end of this week. To do this watch the videos on the isothermal and isobaric ensemble that are in the videos on the understand page for this week. In addition, try to rewatch the material on the canonical ensemble that were provided in the understand section for last week. There are also some example problems on the canonical ensemble that you can try. The best way to consolidate all these ideas would be to attempt

the second essay question listed on the extend page for this (theory) chapter. Again this essay can form part of your portfolio.

What we will be doing in the tutorial:

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 9 . Second essay on extend page in statistical mechanical theory chapter , which is due on (recommended) Friday of week 8 .

Week 9

You should try to understand all the material on the theory of statistical mechanics by the end of the week. To do this watch the remaining videos on how to calculate partition functions for more complicated model systems. A good way to test what you have understood is to try the exercises in the apply section. Lastly, attempt the third essay listed on the extend page for this (theory) chapter. As always this essay can form part of your portfolio.

What we will be doing in the tutorial:

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 10 . Third essay on extend page in statistical mechanical theory chapter , which is due on (recommended) Friday of week 9 .

Week 10

Watch the videos on Monte Carlo simulation and read the article that you have been assigned. In addition, try to read some of the other papers that are in the assignment and try to see how those other papers relate to your article. Try to identify the key idea that your paper contributed to the field. This key idea is what I want you to present. I would like you to explain why this idea is important and some of the context. Do not get bogged down in the mathematics in your paper.

What we will be doing in the tutorial:

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 11 .

Week 11

Start to write up your report on the paper. As with the presentation your aim should be to explain the key idea that you paper contributed to the field, the papers importance and some of the context. Much as with the presentation you do not need to provide a lot of detail of the underlying mathematics.

What we will be doing in the tutorial: During the tutorials this week you will be giving presentations on your papers.

What work should I be handing in this week: Half page report for portfolio , which is due on 16:00 on Tuesday of week 12 .

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Week 12

Finish your reports on the various scientific papers.

What we will be doing in the tutorial: The tutorial time this week can be used to look at reports and give critical feedback on the readability and understandability of the early drafts you are producing

What work should I be handing in this week: Portfolio of work done during the semseter , which is due on 16:00 on Tuesday of week 13 . Final report on paper , which is due on 16:00 on Tuesday of week 13 .