Imperial College London

Student Instructions

Welcome to the Imperial College Aeronautics MSc Pre-Sessional Course. You can use this course to ensure you are up to speed with the prerequisite knowledge required for your degree.

The course consists of 8 modules. Which modules to study depends on your MSc Course and your interests. See Appendix 1 for further information.

Each module consists of a diagnostic test and a mini course. You should firstly attempt the diagnostic test. If your answer to any question incorrectly, we strongly encourage you to study the whole mini course.

The instructions below explain how to use both the diagnostic test and mini course.

Using the Diagnostic Test

Each diagnostic test is designed to give you an indication of how well you understand that subject area.

Once you complete each question, check your response by pressing the 'How Did I Do' button.

– For a correct answer you will see a green tick with no other information
– For an incorrect answer you will see a red cross. Next to the red cross you will be able to see the correct answer by hovering over the script icon next to the red cross. There may also be a partial solution in the "Feedback" section underneath the question (as per image below).

Should you get any of the questions incorrectly, we suggest that you study the full Mini Course. You can navigate back to the Mini Course using the hyperlink at the bottom of the feedback area labelled "available here".

(Please note. No information on how you performed in this assessment is kept or recorded by Imperial College.)

Let $f(x) = \sin(\sin(x))$.

i) Find $p_5(x)$, the Maclaurin polynomial of f consisting of terms of order ≤ 5.

Use * to denote multiplication of any terms in your answer. Use / for division. *Help on using the equation editor.*

$p_5(x) =$

a^b	$\sin(a)$	$\dfrac{\partial}{\partial x} f$	⠿	∞	α	Ω		🗑	❓

0

ii) Hence, or otherwise, calculate $\lim_{x \to 0} \dfrac{x - f(x)}{x^3}$.

$\lim_{x \to 0} \dfrac{x - f(x)}{x^3} =$ [1/2] ⊗

Feedback

i) You should be able to form a Maclaurin series without differentiating, since you know the expansion of $\sin(x)$ and you know how to compose functions.

ii) This should follow quite readily from your Maclaurin series expansion.

Should you need to revise this topic, the relevant material can be found in the 'Series Expansions' section of the minicourse, available here.
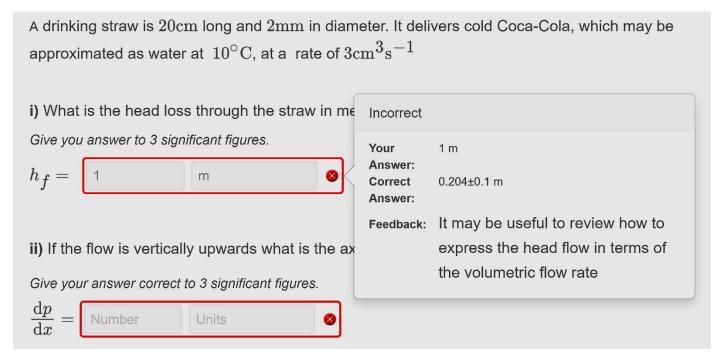
Using the Mini Course

Each mini course consists of an introduction, followed by content arranged into topics. The course is designed to be concise. It contains all the essential knowledge required for studying our MSc, which is more than is needed to pass the diagnostic test.

We advise you to complete the full Mini Course and answer all questions correctly. You do not have to retake the diagnostic test.

The questions in the Mini Course contain in-question feedback - you can access this by clicking the 'How did I do?' feature.

For example:

A drinking straw is 20cm long and 2mm in diameter. It delivers cold Coca-Cola, which may be approximated as water at 10°C, at a rate of $3\text{cm}^3\text{s}^{-1}$

i) What is the head loss through the straw in me

Give you answer to 3 significant figures.

$h_f =$ [1] [m] ✖

Incorrect	
Your Answer:	1 m
Correct Answer:	0.204±0.1 m
Feedback:	It may be useful to review how to express the head flow in terms of the volumetric flow rate

ii) If the flow is vertically upwards what is the ax

Give your answer correct to 3 significant figures.

$\dfrac{dp}{dx} =$ [Number] [Units] ✖

Technical Advice

- We recommend using a laptop or desktop and not a mobile or tablet device.
- We recommend the browsers **Chrome** and **Firefox** and their equivalents on a Mac.
- For security reasons, the browser might display a time-out warning after 30 minutes of in-activity. If this happens refresh the browser.
- We recommended you only work in one active window as working in multiple windows can cause a time out error in the inactive tab as per the advice above.

Troubleshooting

Should you run into any of the following errors this may indicate a third-party cookie issue:

- You are taken to a login page (that you won't be able to log in from) instead of directly to your activity.
- You see the third-party cookies error message (It looks like your browser is blocking third-party cookies...).
- You see an HTTP 403 - forbidden error message.

To rectify these issues, you should.

- Ensure that you are using one of the recommended browsers (Firefox, Google Chrome).
- Ensure third-party cookies are enabled. To enable third party cookies, you may need to change your browser settings using the following instructions given below:

    Google Chrome Help- [Clear, enable and manage cookies in Chrome](#)

    Mozilla Support - [Third-party cookies and Firefox tracking protection](#)

Language Settings

The language displayed in the interface should be English. If it is not, you may need to reorder the language settings using the following instructions given below:

[Change Chrome languages and translate web pages](#) – Google Chrome Help,

[Choose display languages for multilingual web pages](#) – Mozilla Support.

You should then restart your computer after making changes to your language settings.

Disclaimer

By using these resources, you agree with the following terms of use:

The course materials have been added to Möbius to support Aeronautics MSc Students at Imperial College.

Only these students may print and/or download a single copy for their personal, educational use. Further use and sharing of these materials by students or others is prohibited.

Appendix 1

In our MSc courses students should pass a certain number of taught modules and successfully complete a research project. The taught modules are divided into core modules, which each student has to pass, and elective modules, from which each student will be able to choose a necessary number.

- Understanding the core modules of AAE and ACM MSc-s requires knowledge of the material in pre-sessional minicourses 'Introductory Mathematics', 'Introduction to Programming 1, Matlab', and 'Fundamentals of fluid mechanics'. ACM core modules further require 'Introduction to programming 2, C++'.

- Understanding the core modules of Composite MSc requires knowledge of the material in pre-sessional minicourses 'Introductory Mathematics' and 'Stress Analysis'.

Students are requested to use the pre-sessional minicourses to ensure they have the necessary knowledge appropriate to the core modules of the MSc course they are taking.

Additionally, the elective modules and the projects might require knowledge of the material in the remaining pre-sessional minicourses. Since the choice of the elective modules partly depend on the student, the students are advised to check their knowledge of the material in those other pre-sessional minicourses that are within their field of interest.