

**MAS156: Mathematics (Electrical and  
Aerospace)**  
**MAS161 (General Engineering  
Mathematics)**

Prof Koji Ohkitani  
[mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)

Monday 24th September 2018, 5pm  
Diamond LT4

# About the course

MAS156/MAS161 is a twenty-credit (for MAS156) or fifteen-credit (for MAS161), year-long module which covers the mathematics you will need for the first year of your degree.

MAS156/MAS161 is a twenty-credit (for MAS156) or fifteen-credit (for MAS161), year-long module which covers the mathematics you will need for the first year of your degree.

Each week you will

MAS156/MAS161 is a twenty-credit (for MAS156) or fifteen-credit (for MAS161), year-long module which covers the mathematics you will need for the first year of your degree.

Each week you will

- watch some short online video-lectures, each followed by a quick test;

MAS156/MAS161 is a twenty-credit (for MAS156) or fifteen-credit (for MAS161), year-long module which covers the mathematics you will need for the first year of your degree.

Each week you will

- watch some short online video-lectures, each followed by a quick test;
- attend two problem classes to discuss problems related to the videos;

MAS156/MAS161 is a twenty-credit (for MAS156) or fifteen-credit (for MAS161), year-long module which covers the mathematics you will need for the first year of your degree.

Each week you will

- watch some short online video-lectures, each followed by a quick test;
- attend two problem classes to discuss problems related to the videos;
- work on exercises from exercise sheets in your own time.

The module leaders for MAS156/MAS161 are Prof Koji Ohkitani, Dr James Cranch, and Dr Sam Marsh.



The module leaders for MAS156/MAS161 are Prof Koji Ohkitani, Dr James Cranch, and Dr Sam Marsh.

However, they are almost always *not* the best person to contact if you have questions/problems.

- If you have general administrative queries (for example, about late registration, rooms, tutorial groups, and so on), please contact [mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)

The module leaders for MAS156/MAS161 are Prof Koji Ohkitani, Dr James Cranch, and Dr Sam Marsh.

However, they are almost always *not* the best person to contact if you have questions/problems.

- If you have general administrative queries (for example, about late registration, rooms, tutorial groups, and so on), please contact [mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)
- If you have academic questions, please raise these via the discussion board (next slide)

The module leaders for MAS156/MAS161 are Prof Koji Ohkitani, Dr James Cranch, and Dr Sam Marsh.

However, they are almost always *not* the best person to contact if you have questions/problems.

- If you have general administrative queries (for example, about late registration, rooms, tutorial groups, and so on), please contact [mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)
- If you have academic questions, please raise these via the discussion board (next slide)

**Course website**

The course website is at

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>

The course website is at

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>

(also available through MOLE).

The course website is at

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>

(also available through MOLE).

There is a discussion board for the course, found via the course website.

The course website is at

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>

(also available through MOLE).

There is a discussion board for the course, found via the course website. Please use the discussion board to ask (and answer!) questions about the course.



The course website is at

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>

(also available through MOLE).

There is a discussion board for the course, found via the course website. Please use the discussion board to ask (and answer!) questions about the course. Koji, James and Sam will read this occasionally and deal with unanswered questions when appropriate.

# Timetable

Each week you will attend two problems classes.

Each week you will attend two problems classes. For these you will be split into smaller “tutorial groups”.

Each week you will attend two problems classes. For these you will be split into smaller “tutorial groups”. You should have already found your tutorial group (and may have already attended a class) but if not the details are on the course webpage. Make sure you know the times and places.

Each week you will attend two problems classes. For these you will be split into smaller “tutorial groups”. You should have already found your tutorial group (and may have already attended a class) but if not the details are on the course webpage. Make sure you know the times and places.

# Assessment

This module is assessed by



This module is assessed by

- an end of year exam in June (85%);

This module is assessed by

- an end of year exam in June (85%);
- weekly online tests (15%).

This module is assessed by

- an end of year exam in June (85%);
- weekly online tests (15%).

Past papers for the exam will be made available nearer the time.

# **Video lectures and online tests**

The mathematics lectures for this module are short online videos (10–15 minutes in length).

The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online,

The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online, and each video is followed by a short test.

The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online, and each video is followed by a short test. You will be able to re-watch the videos as many times as you like.



The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online, and each video is followed by a short test. You will be able to re-watch the videos as many times as you like.

The videos and online tests are accessed from the link on the course webpage:

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>.

The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online, and each video is followed by a short test. You will be able to re-watch the videos as many times as you like.

The videos and online tests are accessed from the link on the course webpage:

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>.

New videos will be released:

- Mondays at 9am, due the following Thursday at 9am;
- Wednesdays at 9am, due the following Monday at 9am.

The mathematics lectures for this module are short online videos (10–15 minutes in length). As homework before each problems class, you will watch 2–3 videos online, and each video is followed by a short test. You will be able to re-watch the videos as many times as you like.

The videos and online tests are accessed from the link on the course webpage:

<http://engmaths.group.shef.ac.uk/mas156>

<http://engmaths.group.shef.ac.uk/mas161>.

New videos will be released:

- Mondays at 9am, due the following Thursday at 9am;
- Wednesdays at 9am, due the following Monday at 9am.

You won't receive any reminders: it's your responsibility to log in twice a week and watch the videos and do the tests!

In order to help you settle in, we have extended the first deadline to this Saturday at 9am.

In order to help you settle in, we have extended the first deadline to this Saturday at 9am.

We recommend you log in and attempt the tests as soon as possible (preferably today!).

The online tests should be easy to access and use. However, if you have problems

The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);

The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);
- make sure javascript is enabled;



The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);
- make sure javascript is enabled;
- try a different computer.

The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);
- make sure javascript is enabled;
- try a different computer.

If you continue to have problems, post on the discussion board and see if anyone has a good solution.

---

The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);
- make sure javascript is enabled;
- try a different computer.

If you continue to have problems, post on the discussion board and see if anyone has a good solution.

There is a 'Help' page, accessed from the top of the log-in screen.

---

The online tests should be easy to access and use. However, if you have problems

- try using a different browser (e.g. Firefox, Chrome);
- make sure javascript is enabled;
- try a different computer.

If you continue to have problems, post on the discussion board and see if anyone has a good solution.

There is a 'Help' page, accessed from the top of the log-in screen. That gives some tips on how to use the system.

# Problem classes

Your problem class will be led by a lecturer from the School of Mathematics and Statistics.

Your problem class will be led by a lecturer from the School of Mathematics and Statistics. Each class will start with some examples done from the board

Your problem class will be led by a lecturer from the School of Mathematics and Statistics. Each class will start with some examples done from the board followed by problems for you to work on in small groups.



# Exercises

In addition to the problems in the class, you will receive exercise sheets to be completed at home.

In addition to the problems in the class, you will receive exercise sheets to be completed at home. The exercises will provide you with practice, and we strongly recommend you attempt them.

In addition to the problems in the class, you will receive exercise sheets to be completed at home. The exercises will provide you with practice, and we strongly recommend you attempt them. To make the best use of them, you should write out your answers properly,

In addition to the problems in the class, you will receive exercise sheets to be completed at home. The exercises will provide you with practice, and we strongly recommend you attempt them. To make the best use of them, you should write out your answers properly, but you do not hand in the exercises for marking.

# Full-class lectures

There are full-class lectures (like this one) in Weeks 3 and 4.

There are full-class lectures (like this one) in Weeks 3 and 4.  
Details are on the course webpage.



There are full-class lectures (like this one) in Weeks 3 and 4. Details are on the course webpage. Everyone should attend these lectures.

**Text books**

There is no set text book for this course which you have to buy.

There is no set text book for this course which you have to buy. The book 'Engineering Mathematics' by K. A. Stroud and D. J. Booth is often recommended for engineers,

There is no set text book for this course which you have to buy. The book 'Engineering Mathematics' by K. A. Stroud and D. J. Booth is often recommended for engineers, but there are other options.

There is no set text book for this course which you have to buy. The book 'Engineering Mathematics' by K. A. Stroud and D. J. Booth is often recommended for engineers, but there are other options.

I recommend looking in the Library/IC and/or Blackwells at the books available on basic engineering mathematics.

There is no set text book for this course which you have to buy. The book 'Engineering Mathematics' by K. A. Stroud and D. J. Booth is often recommended for engineers, but there are other options.

I recommend looking in the Library/IC and/or Blackwells at the books available on basic engineering mathematics. Feel free to start a thread on the discussion board to discuss the options with other MAS156/MAS161 students.

# Calculators



All calculators used during University exams must be approved by the Student Service Information Desk in the Students Union.

All calculators used during University exams must be approved by the Student Service Information Desk in the Students Union. There is a page on the University webpage which you can use to check if your calculator is OK or not.

All calculators used during University exams must be approved by the Student Service Information Desk in the Students Union. There is a page on the University webpage which you can use to check if your calculator is OK or not.

<http://www.shef.ac.uk/ssid/exams/calculator>

All calculators used during University exams must be approved by the Student Service Information Desk in the Students Union. There is a page on the University webpage which you can use to check if your calculator is OK or not.

<http://www.shef.ac.uk/ssid/exams/calculator>

If your calculator is not an approved model, you can still use it for problem classes

All calculators used during University exams must be approved by the Student Service Information Desk in the Students Union. There is a page on the University webpage which you can use to check if your calculator is OK or not.

<http://www.shef.ac.uk/ssid/exams/calculator>

If your calculator is not an approved model, you can still use it for problem classes but you must get an approved one before the summer exam.

**Reading week**

Week 7 of Semester 1 is a reading week.

Week 7 of Semester 1 is a reading week. There will be no lectures or tutorials for MAS156/MAS161 in this week,



Week 7 of Semester 1 is a reading week. There will be no lectures or tutorials for MAS156/MAS161 in this week, and you should use it to catch up on all the material from the course so far.

# Engagement

To get the best from this module, we expect you to

To get the best from this module, we expect you to

- attend all classes;

To get the best from this module, we expect you to

- attend all classes;
- make time to watch the videos with full attention before each class;

To get the best from this module, we expect you to

- attend all classes;
- make time to watch the videos with full attention before each class;
- work on the exercise sheets at home;

To get the best from this module, we expect you to

- attend all classes;
- make time to watch the videos with full attention before each class;
- work on the exercise sheets at home;
- use the discussion board for extra help.

# Syllabus, Weeks 1–4



In the first section of the course, we will cover *functions*.

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ ,

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ , take an input number,  $x$ , and assign an output,  $f(x)$ , according to a given rule.

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ , take an input number,  $x$ , and assign an output,  $f(x)$ , according to a given rule. Functions are fundamental to mathematics,

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ , take an input number,  $x$ , and assign an output,  $f(x)$ , according to a given rule. Functions are fundamental to mathematics, so we'll start with the basic definitions and terms

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ , take an input number,  $x$ , and assign an output,  $f(x)$ , according to a given rule. Functions are fundamental to mathematics, so we'll start with the basic definitions and terms (such as domain and range)

In the first section of the course, we will cover *functions*.

Functions, such as  $f(x) = x^2$  or  $g(x) = e^x$ , take an input number,  $x$ , and assign an output,  $f(x)$ , according to a given rule. Functions are fundamental to mathematics, so we'll start with the basic definitions and terms (such as domain and range) used when discussing them.

We will look at properties that functions may have,



We will look at properties that functions may have, in particular we discuss odd, even and periodic functions,

We will look at properties that functions may have, in particular we discuss odd, even and periodic functions, and also what is meant by a function being *continuous*.

We will look at properties that functions may have, in particular we discuss odd, even and periodic functions, and also what is meant by a function being *continuous*.

The *trigonometric functions* are widely used, so we'll recap the basics of these,

We will look at properties that functions may have, in particular we discuss odd, even and periodic functions, and also what is meant by a function being *continuous*.

The *trigonometric functions* are widely used, so we'll recap the basics of these, including the algebraic identities that hold.

---

We will look at properties that functions may have, in particular we discuss odd, even and periodic functions, and also what is meant by a function being *continuous*.

The *trigonometric functions* are widely used, so we'll recap the basics of these, including the algebraic identities that hold. We will also look at polynomials, and how the binomial theorem can simplify working with them.

---

We will finish by looking at when functions are *invertible*

We will finish by looking at when functions are *invertible* and investigate some special instances including exponentials, logarithms and hyperbolic functions.

We will finish by looking at when functions are *invertible* and investigate some special instances including exponentials, logarithms and hyperbolic functions.

In Week 4 we will move on to *differentiation*.



# Activity

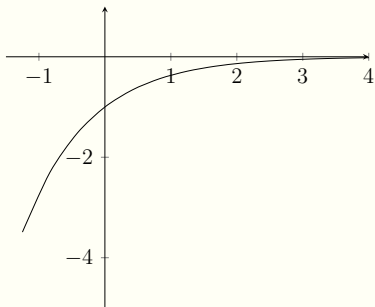
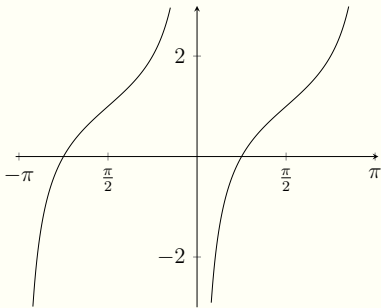
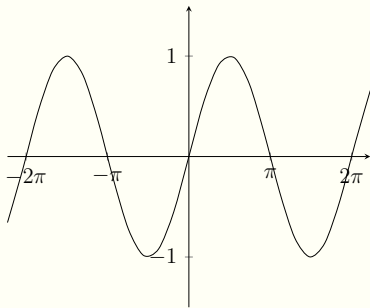
**Activity.** Introduce yourself to the person next to you (or talk in a group of three if easier).

**Activity.** Introduce yourself to the person next to you (or talk in a group of three if easier). On the next slide I will show you graphs of three functions.

**Activity.** Introduce yourself to the person next to you (or talk in a group of three if easier). On the next slide I will show you graphs of three functions. Your job is to try to identify the functions that have that graph.

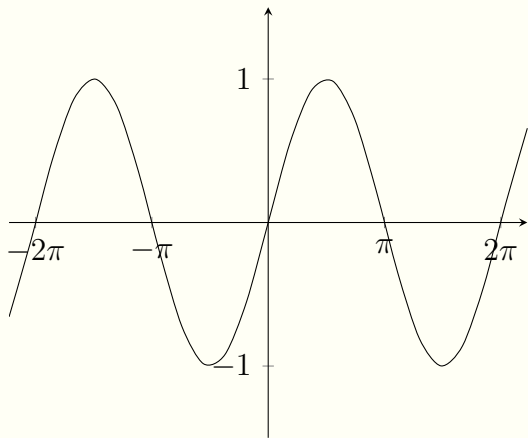
**Activity.** Introduce yourself to the person next to you (or talk in a group of three if easier). On the next slide I will show you graphs of three functions. Your job is to try to identify the functions that have that graph.

Once you have identified the functions, discuss any understanding you have of the terms *domain*, *range*, *odd*, *even*, *periodic*, and *continuous* which appeared in the earlier slides.



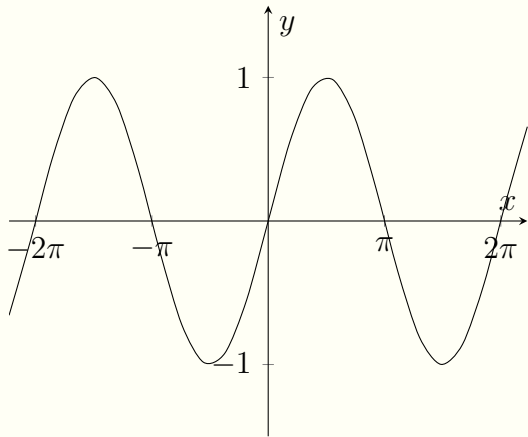
Terms: *domain*, *range*,  
*odd*, *even*,  
*periodic*, *continuous*.

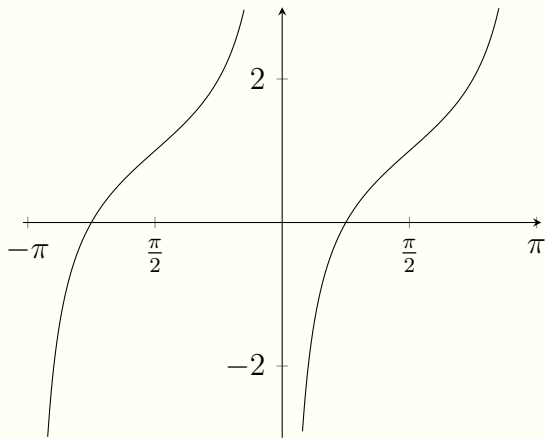
# Answers



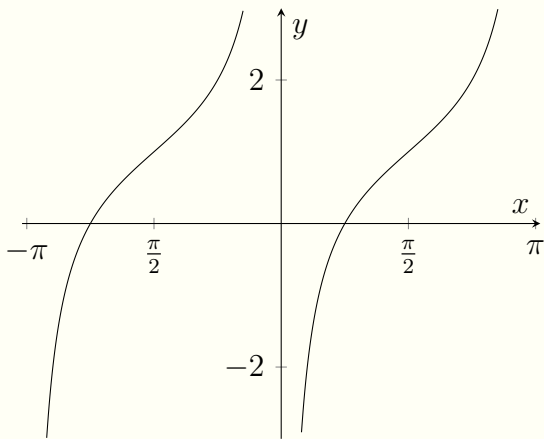


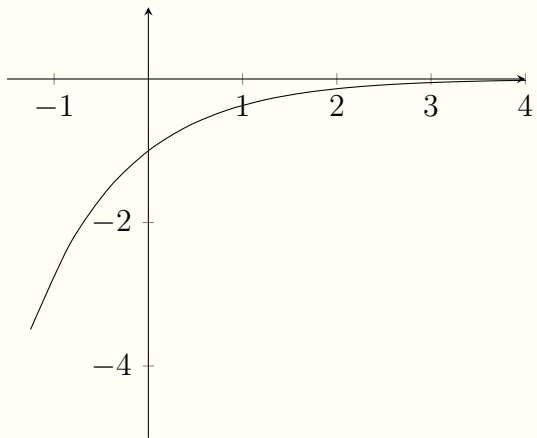
$$y = \sin x$$



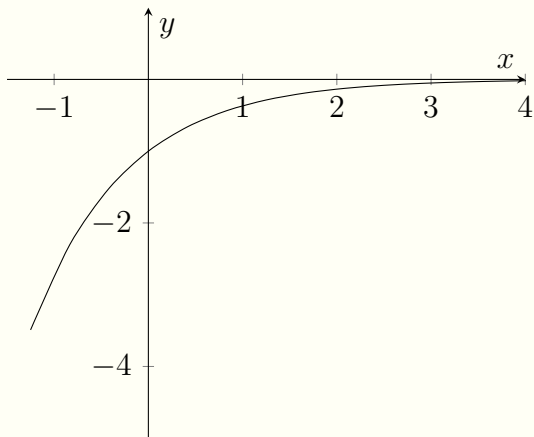


$$y = \tan\left(x - \frac{\pi}{2}\right) + 1$$





$$y = -e^{-x}$$



# Reminders

- Make sure you know your problem class group (from the course website).

- Make sure you know your problem class group (from the course website).
- Log in to see your first three video-lectures and online tests.



- Make sure you know your problem class group (from the course website).
- Log in to see your first three video-lectures and online tests. (You must watch these before your second problem class, in some cases you may already have watched them);

- Make sure you know your problem class group (from the course website).
- Log in to see your first three video-lectures and online tests. (You must watch these before your second problem class, in some cases you may already have watched them);
- Ask me for help if anything is unclear (or email [mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)).

- Make sure you know your problem class group (from the course website).
- Log in to see your first three video-lectures and online tests. (You must watch these before your second problem class, in some cases you may already have watched them);
- Ask me for help if anything is unclear (or email [mas-engineering@sheffield.ac.uk](mailto:mas-engineering@sheffield.ac.uk)).

I hope you enjoy the first few weeks of the course.