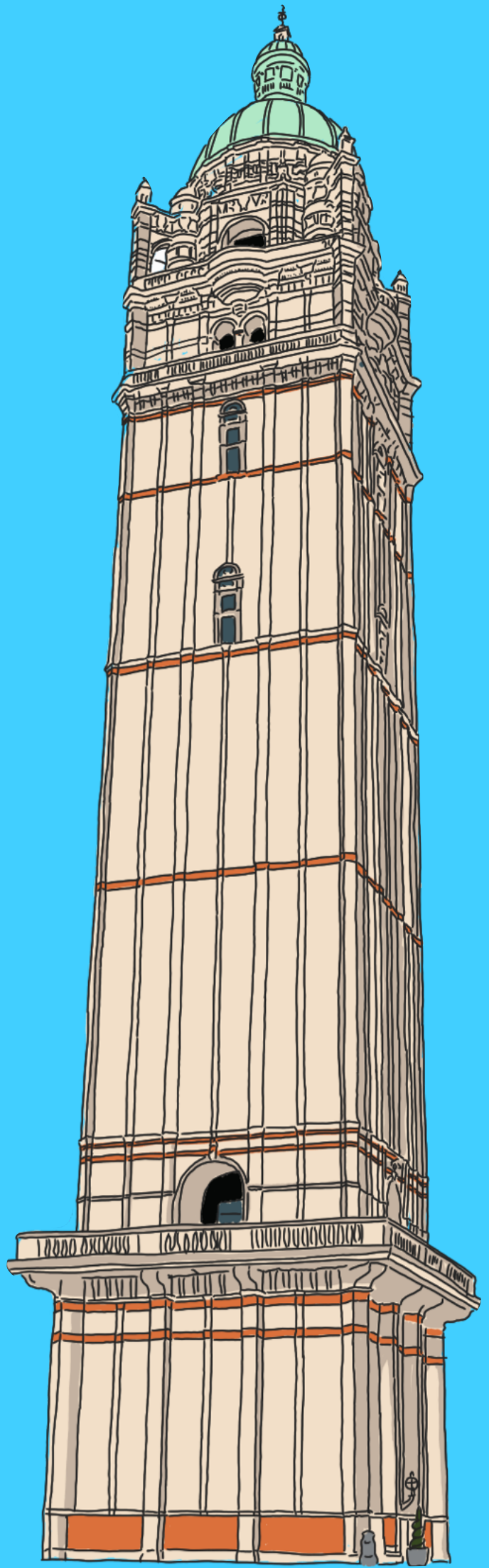


WELCOME TO IMPERIAL!

YOUR GUIDE TO
STARTING A BRILLIANT
PHYSICS JOURNEY



Hi there!

Firstly - Congratulations and a huge well done!

Welcome to Imperial and, more specifically, welcome to the physics department.

We've put together this welcome guide full of tips and need-to-knows before you start your first term here.

We hope this will help you know what to expect, and how to make the most of your time here.

See you around!

We'd like to give a special thanks to every student and member of staff that contributed to this booklet.

**This booklet was created as part of a 2020/21 Student Shapers project, investigating the impact of A-Level cancellations on the exam experiences of first year physicists.*

Student Shapers is a staff-student partnership, that enables students to collaborate with staff on different projects to help improve others' college experience :)

If you have any questions, feel free to get in touch!

We hope you enjoy!

-Rebekah, Nabihah, Amy and Jessie

Contact Details

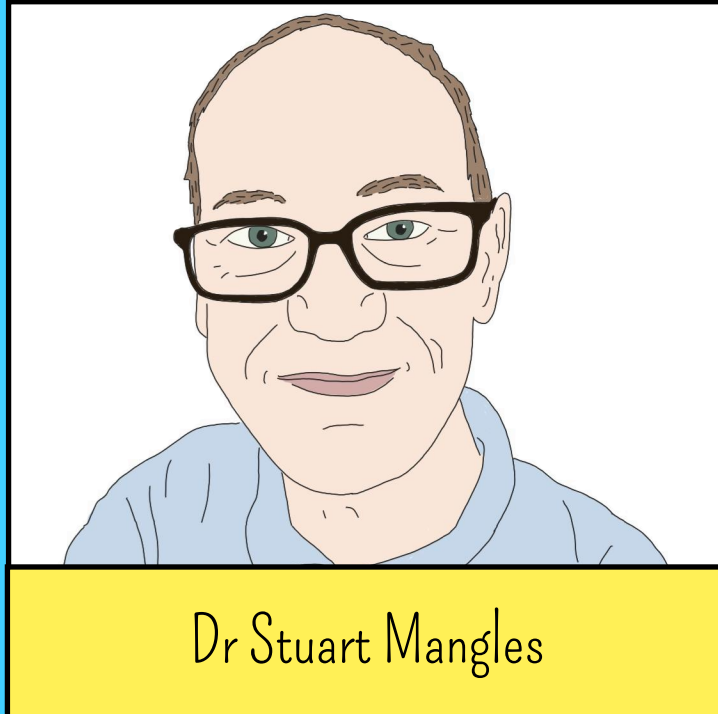
Jessie Durk - jessie.durk10@imperial.ac.uk

Amy Smith - a.smith21@imperial.ac.ac.uk

Nabihah Rahman - nabihah.rahman19@imperial.ac.uk

Rebekah Christie - rebekah.christie20@imperial.ac.uk

Meet Your Head of Year



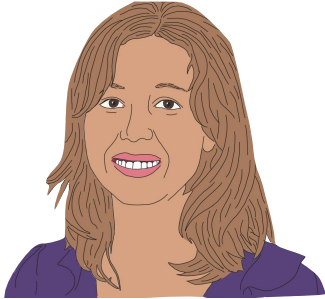
Congratulations on securing your place on one of the physics courses here at Imperial College!

Over the next three or four years we aim to help you develop the skills and knowledge to be the best physicist you can be.

As the head of year one, I am one of your main points of contact about anything and everything that is happening throughout your first year here at Imperial.

You will see me regularly at the “week ahead” sessions throughout term, I will meet regularly with your year reps to get your feedback about the course, and you can always contact me at ph.hoy1@imperial.ac.uk if you have any questions or concerns about the course.

Who You Should Know

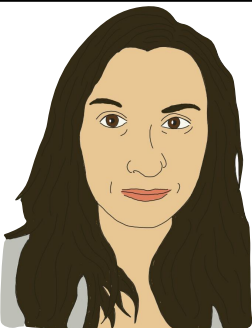


Mery Fajardo



m.fajardo@ic.ac.uk

Mery is the Admissions and Disabilities Officer. It's her job to act on behalf of disabled students and those who have specific learning difficulties - she's there to ensure that you are given any reasonable adjustments you need and is always a friendly ear to offer care and support if you are encountering difficulties. You'll find her on the 3rd floor!

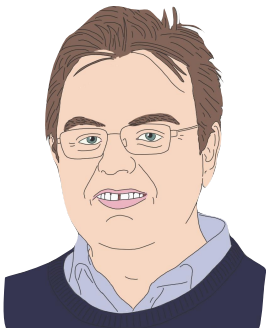


Dr Yasmin Andrew



y.andrew@ic.ac.uk

Yasmin is the Student Liaison Officer. Her role is to be the main link between you, as undergraduate students, and staff. She works closely with the academic and wellbeing student representatives that you elect each year to ensure that your views are passed on to staff in staff-student committee meetings. You'll find her on the 3rd floor!



Dr Ingo Mueller-Wodarg

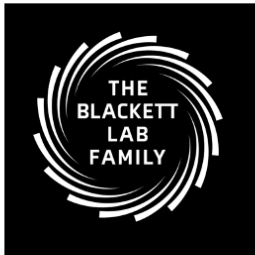


ph.seniortutor@ic.ac.uk

Ingo is your Senior Tutor. His role centres around your welfare and making sure that personal and cohort matters are dealt with in the best way, such as mitigating circumstances. Like Yasmin, he is always present at staff-student committee meetings to ensure that your issues are addressed. You'll find him on the 7th floor in Huxley!

Communities in Blackett

The Blackett Lab Family



The Blackett Lab Family is a collective of physicists of African/Caribbean Heritage across the UK. Primarily connecting through Facebook, BLF exists to "diversify perceptions of physics and promote black representation at all levels in the field." The BLF network offers academic and professional support, casual socialising, and opportunities to effect positive social change.

You can find out more about the Blackett Lab Family at: www.theblackettlabfamily.com

Join the BLF:



Women in Physics (WiP)



WiP is a student and staff led collective who aim to offer women studying and working in the department the opportunity to network with each other. They regularly host social events and training opportunities throughout the year, such as lunchtime talks, cocktail evenings and machine learning courses. A highlight from 2020/21 includes a picnic in Prince's Gardens (Free food anyone?)

Learn more about WiP:



Physics LGBT+ Committee



The Physics LGBT+ Allies Network is made up of a group of specifically trained members of the Department who can be approached and provide support for LGBT+ related issues. Posters are displayed around the Department with photos of the Allies, they can also be identified by the 'Ally' stickers on their office door.

Things to Join

PhySoc



Hello freshers and welcome to Imperial! I'm Jacob, a second-year student and the President of the Imperial College Physics Society. This year we have a packed calendar of exciting events, which includes socials, guest speakers, and skills workshops. We also run the Mums and Dads programme. You'll be partnered with student mentors from years above and given loads of great guidance. We're excited for you to see all the events we have in store and to start your physics journey at Imperial!

-Jacob Edginton, PhySoc President

Quick Tip #1

As a member of the Physics Department, you are automatically a member of PhySoc, no need to purchase membership! You should however, purchase a hoodie :p

Connect With PhySoc:



@physoc.imperial

Imperial Physics Review



The Imperial Physics Review (IPR) is a recently founded student physics magazine in collaboration with PhySoc. IPR has a very simple (and very significant) mission - to get students reading about physics! From articles about 'The Thermodynamics of Football' to 'The Top 3 Places to Live In the Solar System', there's a wonderful variety of topics to read about! Reading isn't the only way to support IPR - you can also write your own articles about the physics that interests you. Not only does this make you more engaged with your subject, it's also a brilliant opportunity to improve your science communication skills. Get involved by getting in touch!

Connect With IPR:



@imperial.physics.review

First Year at a Glance

The main point of first year is to get everyone up to speed with mathematics and lay the foundations for second year. You can see it as consolidation of A-Levels, with a few added extras.

In First Year, you will take a total of six modules.

Core Modules:

Mechanics and Relativity

Oscillations and Waves

Vector Fields, Electricity and Magnetism

Practical Physics, Computing and Problem Solving

Statistics of Measurement and The Summer Project

Elective Modules:

Mathematical Analysis*

Advanced Electronics

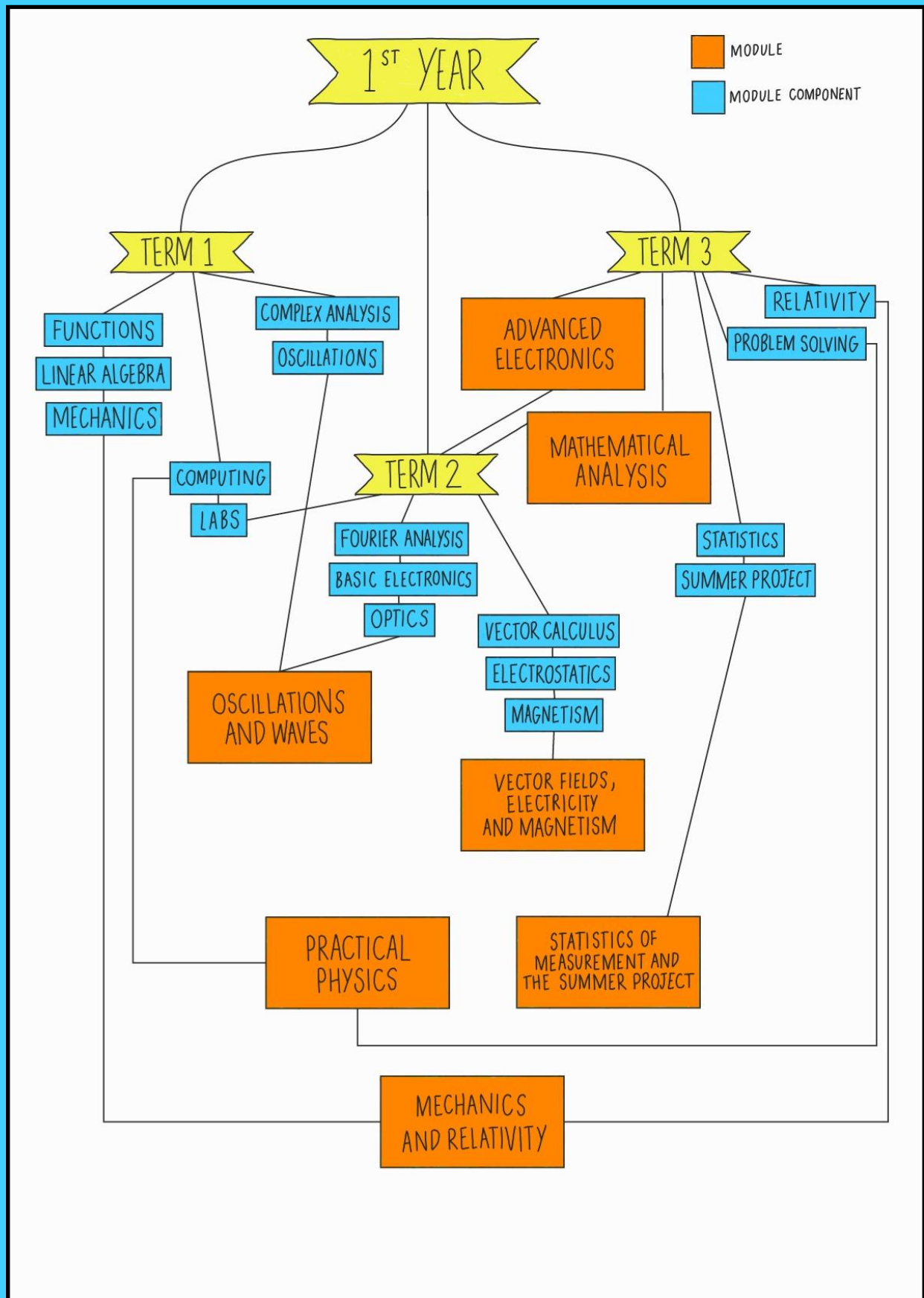
Language Course**

*Compulsory for Theory Students

**This is for students on the Year Abroad Course only

If you are on Year Abroad Course, you will take the Language Course. If you are on the general Physics Course, you will choose between Maths Analysis and Advanced Electronics

First Year at a Glance



How Will I Learn?

Lectures

Typically 50 minutes long.

This year, lectures will be online. The lectures for the week will be posted on Panopto, but you will be able to access them through BlackBoard Learn.

Seminars

This year, seminars will take place in-person. Seminars give you a chance to discuss the week's course content in greater detail. You will work through questions in increasing difficulty with your group, and a Teaching Assistant (TA) nearby to guide you if necessary.

Quick Tip #2

Seminars alternate, (i.e.-Week 2 M&R, Week 3 O&W). You may find it helpful to plan your lecture schedule around this.

Academic Tutorials

This year, academic tutorials will take place in person. This is where you can bring any extra questions you have from your problem sheets to your tutor. They may also have a set of questions prepared to look over.

Note – Complete your Think About the Physics Quizzes!

Problem Sheets

Think of your problem sheet as the list of questions at the end of the chapter. This is where you get to test your understanding of the week's concepts. Roughly twice per term, you will complete an assessed problem sheet (APS).

How Will I Be Assessed?

Written Exam

The main form of assessment is a written exam. Your first exam will be in January 2022 and is for the Mechanics and Relativity module.

Group Projects

Physics is a collaborative subject, no person is an island! There are several great opportunities to collaborate with your peers in your first year. In term 1, you will work on a research project in Oscillations and Waves, to develop your professional skills. In term 3, you'll be working on the summer project, lasting the whole term with an assigned supervisor for guidance.

Computing Projects

In your first term at Imperial, you will have a few introductory lectures and computing lab sessions, culminating in a computing project where you use the skills you've learnt in a physical context. In the summer term, you'll also be working on two simulation projects; a group project applying knowledge from your Statistics of Measurement lectures, and an individual Jupyter Notebook task applying knowledge from your Relativity lectures.

Other:

Sometimes you can gain course credit for filling things in, e.g 'Think About the Physics' quizzes. Here you evaluate how confident you feel with the lecture material, your answers inform what is discussed in your academic tutorials.

You will also write a topical review about an assigned research paper for Mechanics and Relativity. In VFEM seminars, you will also be introduced to 'PeerWise', a forum wherein you will write questions for your peers and answer some too!

Tips for Online Learning

1. **Create a timetable.** It will add structure to your day, and you can space out your work and add in breaks.
2. Take notes during the lecture, pause, and **take a break if you need to** - get some time away from the screen!
3. **Keep your study space clear** – try not to work in your bed, it will blur the lines between work and play.
4. Turn on your camera in any online small groups (if you're comfortable), and actively participate, **it will help you settle in more.**
5. **Know when to switch off**, it is easy to work all day when online. Give yourself time to unwind in the evening.

Take this to Heart

1. **You belong at Imperial.** You are not an imposter; you deserve to be here.
2. You offer something unique that nobody else can.
3. **It is okay if you don't understand something straight away.** Researchers are stuck most of the time anyway!
4. **If you were an expert in your field,** you would not need to be here. You have come here to learn.
5. The environment is different here, and the work is a step up, but **nobody wants to see you fail.**
6. You can succeed, and **you will succeed.**
7. It is okay to make mistakes, **nobody has ever excelled without failure.** Pick yourself up, dust yourself off and **keep going.**
8. If you are finding something difficult, **ask for help.**
9. **Don't feel embarrassed** to ask for help. Everybody needs it.
10. **Enjoy yourself,** you know why you chose to study physics, make the most of your time here!

**“If you do not
understand
something, it is the
lecturer’s fault”**

-Dr Michael Coppins

What If I Don't Understand Something?

Remember that this is school, you're bound to find something difficult. It doesn't matter if you're having trouble at the beginning of the year, or at the end of the course:

Never be afraid to ask for help.

If you're a bit confused you can:

- Talk to your course mates
- Go to the Physics Helpdesk
- Go to Office Hours

If you don't feel comfortable doing any of these things, **email your lecturer, they will be more than happy to help**

Writing An Email

Quick Tip #3

Not all academics are Professors. You can find out their title by looking at their webpage or some course information.

Always start your email with Dear Professor Surname or Dear Dr Surname, unless they've made it clear to you that they're happy for you to call them by their first name.

The screenshot shows an email draft interface. At the top, the 'To' field contains 'richard.feynman@imperial.ac.uk' and the 'Cc' field is empty. The subject line is 'Left Sock Principle'. The body of the email is handwritten and reads: 'Dear Prof. Feynman, I hope you are having a wonderful week. I have a question about the left sock principle in lecture 13. The Fundamental Washing Machine Equation (FWME) features the kinetic energy of the sock and a potential term. For the case where the sock is a left sock, the potential energy term vanishes. I'm not quite sure why this is the case. If left socks always have a hole in them, wouldn't they always have a non-zero potential? I would appreciate if you could clarify why the FWME is a special case.' The email ends with 'Kind regards, Albert'. Below the text is a rich text editor toolbar with icons for bold, italic, underline, link, unlink, list, and other formatting options. At the bottom of the toolbar are buttons for 'Send', 'Discard', and icons for attachments, images, emojis, and a pencil. Red arrows point from yellow tip boxes to specific parts of the email: one points to the salutation 'Dear Prof. Feynman', another points to the main body of text, and a third points to the sign-off 'Kind regards, Albert'.

To richard.feynman@imperial.ac.uk Bcc

Cc

Left Sock Principle

Dear Prof. Feynman,
I hope you are having a wonderful week. I have a question about the left sock principle in lecture 13. The Fundamental Washing Machine Equation (FWME) features the kinetic energy of the sock and a potential term. For the case where the sock is a left sock, the potential energy term vanishes. I'm not quite sure why this is the case. If left socks always have a hole in them, wouldn't they always have a non-zero potential? I would appreciate if you could clarify why the FWME is a special case.

Kind regards,
Albert

Send | Discard

Make sure your email is clear and the person reading it has all the relevant information. Keep the tone polite. Don't skip proof-reading!

Use a sign-off such as Kind Regards or Best Wishes, followed by your name, to end your email.

Quick Tip #4

The main mode of communication that members of the department and College will use to contact you, is via email. So make sure that you check yours regularly.

MECHANICS AND RELATIVITY

MODULE OVERVIEW

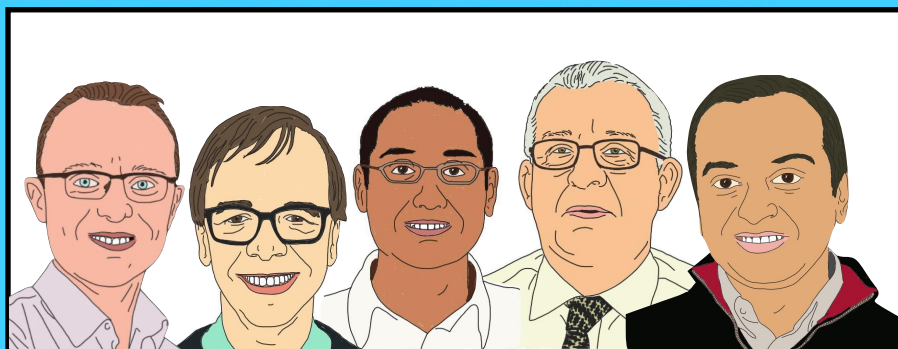
"We hope you'll enjoy seeing how powerful applying apparently simple concepts can be. Lots of students enjoy the informal atmosphere of the seminars and many students particularly enjoy the relativity course and trying to understand the weirdness and apparent contradictions within relativity. Overall, this module will give you a good grounding as you start your degree."



KEY POINTS

- 15 ECTS (1/4 of first year!)
- 70% Exam! (First day back in Term 2!)
- 30% Coursework
(APS, Seminars, Topical Review, Computing Project)
- 4 Lecture Courses
Term 1: Functions, Linear Algebra and Classical Mechanics
Term 3: Relativity

MEET THE MODULE TEAM



**"The Universe is mathematical,
Respect the power of
the subject."**
-Dr Frank Berkshire

YOUR MODULE LEADER SAYS

To Make The Most Out of M&R You Should:

Realise early that needing to struggle to understand difficult concepts, and making mistakes are an everyday part of what being a physicist involves, for academics and professionals as well as successful students, not a sign that you are 'an impostor'! So don't be afraid of 'being wrong' - this is all part of the learning process; by working at things you can get there!

The Best Physics Joke Is:

Q: What do you get if you cross a chicken and a rock climber?

A: It can't be done; a rock climber is a scaler!

(Come back halfway through term 1 if you don't understand this now)

You'll Like M&R Because:

In term 1 as well as seeing some new things you'll take some ideas that you've already seen before at school (like vectors, Newton's laws and differentiation and integration) and take them further to see what they lead on to and some of what can be done with them. In term 3 you'll have the chance to get your head around Einstein's special theory of relativity!



Dr Jon Fenton

j.fenton@imperial.ac.uk

Prof Zulfikar Najmudin

Lectures:

Vectors and Matrices

Favourite Physics 'Joke':

"It is a miracle that curiosity survives formal education." - Albert Einstein

Before You Start:

Hopefully, we will be starting quite at the beginning, so preparation is not really necessary. Bring a pencil!

Top Tip to Ace This Course:

If you don't understand something then ask!

Words of Wisdom:

Take up a new hobby/sport/pastime, university is much more than just studying!



z.najmudin@imperial.ac.uk

Prof Matthew Foulkes

Lectures:

Classical Mechanics

Favourite Physics Joke:

The cop looks at Heisenberg and says:

"Sir, do you realise you were going 50 mph in a 30 mph zone?"

Heisenberg replies: "Great, now I'm lost!"

Top Tip to Ace This Course:

Solving problems and old exam questions is the most important part of learning physics — more important than memorising equations or understanding the lectures perfectly.

Before You Start:

Do nothing! You deserve a break this summer.

If you're really enthusiastic revise vectors, practise mechanics problems that require you to resolve vectors.

Words of Wisdom:

Learning physics is hard and there will be times when you get stuck.



wmc.foulkes@imperial.ac.uk

Prof Frank Berkshire

Lectures:

Mathematics - Functions

Favourite Physics Joke:

OF COURSE Light obeys Fermat's Principle of Least Time.
How does it know how to do this? Well it is incredibly bright...

Before You Start:

Gain and polish understanding of previous concepts. The course starts with reinforcement and enhancement of basics and progresses to more advanced topics needed way beyond the M&R module. Look everywhere for applications!

Top Tip to Ace This Course:

Read the notes very carefully. Attempt all problems and seek others, particularly those given for Reflection and Discussion with staff and fellow students - that is how to improve knowledge and skills. Study actively - mathematics is not a spectator sport.

Words of Wisdom:

Try to stay sensibly 'up to date' with the hard work. Make sure that you reserve time to play hard too!



@ f.berkshire@imperial.ac.uk

Dr Mitesh Patel

Lectures:

Special Relativity

Favourite Physics Joke:

A photon goes up to the check-in counter at the airport and the assistant asks if they have any luggage. "No", the photon replies, "I like to travel light."

Before You Start

Be ready to challenge a lifetime's worth of everyday intuition.

Top Tip to Ace This Course:

Work the problem sheet!

Words of Wisdom:

Learning physics is a marathon and not a sprint. Your initial level does not matter. What counts is that you keep improving, little-by-little. Keep thinking about physics, working the problems, thinking about what they mean and enjoying that as much as you can.



@ mitesh.patel@imperial.ac.uk

OSCILLATIONS AND WAVES

a CORE module

MODULE OVERVIEW

“The module is a coordinated introduction to wave phenomena in different aspects of physics - both practical and theoretical. It includes phenomena and notation that will be new to most students. It will definitely be challenging at times but will give you a basis for understanding the majority of time-varying phenomena you will study as an undergraduate.”

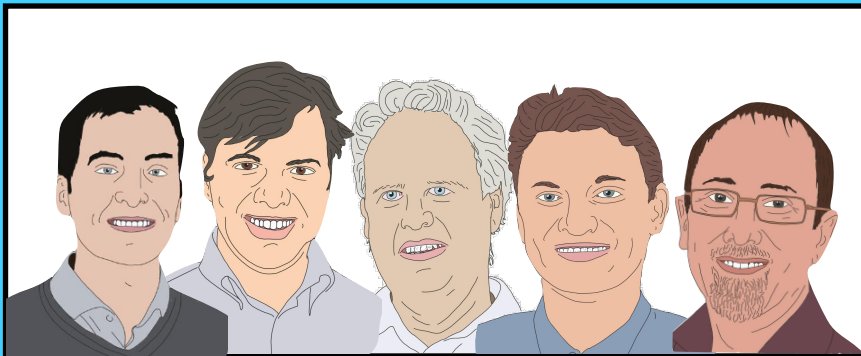


KEY POINTS

- 15 ECTS (1/12th of first year!)
- 70% Exam (Term 3)
- 30% Coursework
- 5 Lecture Courses

Term 1: Complex Analysis & Oscillations and Waves
Term 2: Fourier Analysis, Basic Electronics and Optics

MEET THE MODULE TEAM



“Don't be scared of being confused. That is how you know you are learning new things!”
-Prof Carlo Contaldi

YOUR MODULE LEADER SAYS

To Make the Most of O&W You Should:

Think about the different approaches to waves shown in each of the lecture courses. You will see these crop up in many other courses during the degree.

The Best Physics Joke Is:

There is the one about what one cosmological relic photon said to the other... but it is lost on most people.

You'll Like O&W Because:

The physics and underlying maths will be applicable to almost all other courses you will take as an undergraduate in physics.



Prof Carlo Contaldi

Prof Vitali Averbukh



 v.averbukh@imperial.ac.uk

Lectures:

Complex Analysis

Favourite Physics Joke:

Please see page 21.

Before You Start:

We start from the very beginning, assuming very little prior knowledge, so no preparation is really needed. You only need to be prepared to work continuously once on the course.

Top Tip to Ace This Course:

Solve as many exercises as you can find. Schaum's series is a good source of those, once the problem sheets are exhausted.

Words of Wisdom:

Your success in Imperial is only 50% your intelligence and creativity. The other 50% are the trivial organisation and systematic approach - don't spoil the chances given to you by what forms the first 50% through neglecting the second 50%!

Dr Michael Coppins



 m.coppins@imperial.ac.uk

Lectures:

Oscillations and Waves

Favourite Physics Joke:

Two hydrogen atoms walk into a bar. One says "I've lost my electron!". The other says "Are you sure?". The first one says "Yes, I'm positive."
(As I always say, the old ones are the best ones.)

Before You Start:

You should aim to be reasonably familiar with the stuff covered already in term 1 in the preceding part of the O&W module, particularly complex analysis, and also the 1st Year Mechanics course.

Top Tip to Ace This Course:

Do the in-lecture quizzes as you go along, talk to your colleagues about the course material, and attend office-hours if you don't understand something.

Words of Wisdom:

If there is something in the course you don't understand it's not your fault, it's my fault.

Mr Chris Carr

Lectures:

Basic Electronics

Favourite Physics Joke:

Copper atom: "I've lost an electron"

Physicist: "Are you sure?"

Copper atom: "Yes, I'm positive"

Note: this is a very basic electronics joke; for more fun, take the 'Advanced Electronics' option.

Before You Start:

No advance knowledge needed, we'll start with the 'basics' of circuit theory and then build on this. There will be comprehensive course notes and it will really help if you can read these in advance of each lecture.

Top Tip to Ace This Course:

Do the 'quick exercises' after each lecture - these link directly to each lecture topic and really help to build understanding.

Words of Wisdom:

Attend the office hours - it's always fun to talk about electronics!



 c.m.carr@imperial.ac.uk

Prof Carlo Contaldi (ctd)

Lectures:

Fourier Analysis

Before You Start:

Think about the complex exponential introduced in earlier module components (it's just cosines and sines!). Make sure you are familiar with running python notebooks (you will learn how to do this as part of the introduction to the first-year lab).

Top Tip to Ace This Course:

Lots of practical examples using Python code and physical demonstrations and, of course, some good old-fashioned bluegrass banjo bashing.

Words of Wisdom:

Don't be scared of being confused. That is how you know you are learning new things!



 c.contaldi@imperial.ac.uk

Prof Mike Damzen

Lectures:

Optics

Favourite Physics Joke:

Why can't you trust an atom?
They make up everything!

Before You Start

Try to absorb the key points from the previous 4 courses on the Oscillations and Wave Module, as some of Optics is built on them: e.g. use of complex maths notation of waves; general wave physics; and the Fourier analysis course is probably quite new to 1st Year students and is used in both the light diffraction and imaging part of Optics course.

Top Tip to Ace This Course:

Discussing course content with a few others in your class sounds a good approach to bounce ideas and use collective thinking to gain further insight, especially in any difficult content.

Words of Wisdom:

All courses add to your armoury of knowledge and ability as a physicist and human. Enjoy the course and keep enquiring!



m.damzen@imperial.ac.uk

* Prof Vitali Averbukh's Favourite Physics Joke *

Continued from Page 19

From my (previous) lecture course on Group Theory (Lecture no. 1), introducing the identity operation, E :

$$g^*E = E^*g = g$$

Lecturer (myself): This expression is usually read as "right identity is equal to left identity" which makes it the first and the last political statement on this course.

VECTOR FIELDS, ELECTRICITY AND MAGNETISM

a CORE module

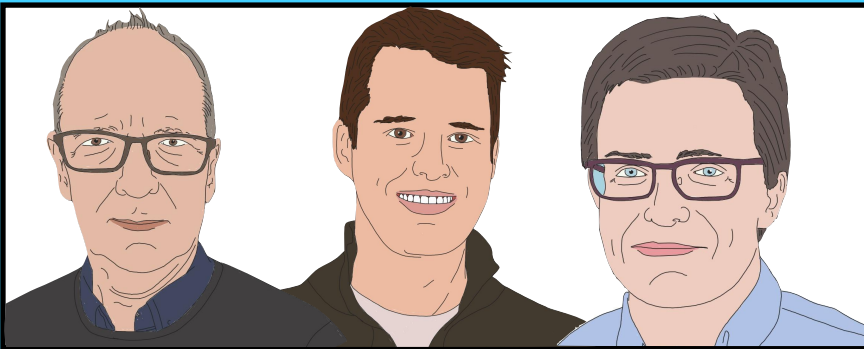
MODULE OVERVIEW

"The goal of the VFEM module is to introduce you to the equations of electromagnetism – Maxwell's equations – using the language of vector calculus... I think VFEM is unique in how it blends the maths with the physics: only by learning vector calculus can you see the true beauty of Maxwell's equations."

KEY POINTS

- 7.5 ECTS (1/8th of first year!)
- 30% Exam! (Term 3)
- 70% Coursework (Seminars, APS, 'PeerWise')
- 3 Lecture Courses
Term 2: Vector Calculus, Electrostatics and Magnetism

MEET THE MODULE TEAM



"My top, top tip for any course is: go and read a book."
-Prof Tim Horbury

YOUR MODULE LEADER SAYS

To Make The Most Out of VFEM You Should:

Follow the timetable, do as many problems as you can, and talk to us about what you're learning. We know how much you've all been through in the past couple of years, and so we want to hear from you to find out how you're doing and to talk about physics!

The Best Physics Joke Is:

You can't trust atoms, they make up everything!

You'll Like VFEM Because:

We've worked really hard to tie the module to our research, and in the previous two years we've had a lot of positive feedback about this. For example, in studying magnetism with Prof. Horbury, he will tell you all about the Solar Orbiter magnetometer, an experiment which was built at Imperial in Blackett, and is now in deep space measuring the Sun's magnetic field in the heliosphere.



Dr Jonathan Eastwood

Prof Stephen Warren

Lectures:

Vector Calculus

Favourite Physics Joke:

What is the volume of a pizza of radius z and thickness a ?

Before You Start

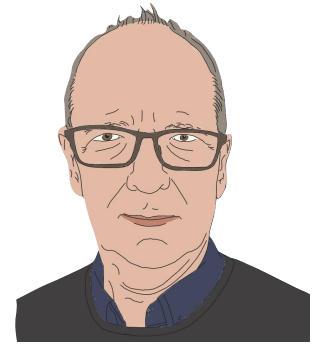
Review Functions Chapters 3 and 4.

Top Tip to Ace This Course:

Do the problems in the problem sheets as soon as possible, do problems from the 2 textbooks, and do problems from past exams.

Words of Wisdom:

Don't be worried about bothering me!



s.j.warren@imperial.ac.uk

Dr Jonathan Eastwood (ctd)

Lectures:

Electrostatics

Before You Start:

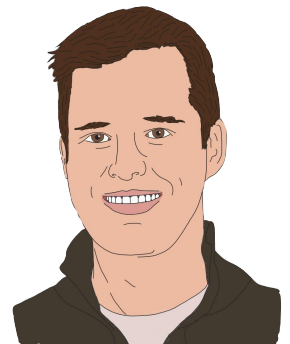
The main thing is to get a good start in the vector calculus work that comes first.

Top Tip to Ace This Course:

Although I will give you a handout, you should make your own notes when you watch the lectures - learning how to take notes is a life skill you will never regret investing time in!

Words of Wisdom:

Don't forget to enjoy it! Remember you are here because you are inspired by learning physics, and it can be easy to forget that among all the other pressures. Look for the interesting things, and don't be afraid to ask random questions. We all love talking about physics, otherwise we wouldn't be working here!



jonathan.eastwood@imperial.ac.uk

Prof Tim Horbury

Lectures:

Magnetism

Favourite Physics Joke:

Hydrogen atom 1: I think I've lost my electron.

Hydrogen atom 2: Are you sure?

Hydrogen atom 1: Yes I'm positive.

Before You Start:

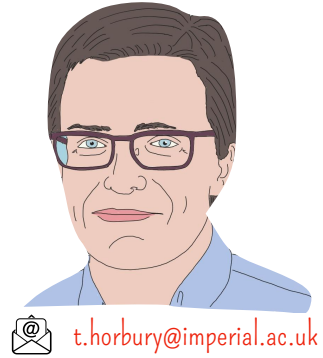
No need to prepare, but we build on vector fields and electricity, and of course mechanics, so the more up to date you are with those courses by the time we start, the easier you will find things.

Top Tip to Ace This Course:

My top, top tip for any course is: go and read a book. We recommend several good textbooks for this course, and some of them are available free online from the library. No need to read from cover to cover, but if there are bits of the course you don't understand, spending half an hour with a book can really help to get a different perspective. They also have lots more problems that you can use for practice.

Words of Wisdom:

Don't worry if you don't understand everything in the courses, I certainly didn't when I was a student and everyone else is just the same.



STATISTICS OF MEASUREMENT AND THE SUMMER PROJECT

a COMPULSORY module

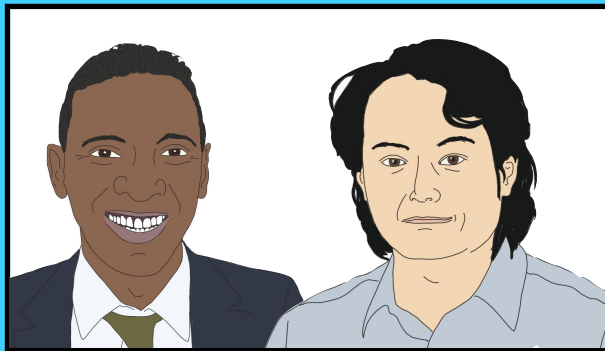
MODULE OVERVIEW


“Physics is centred on exploring the real world, the Universe we live in. And the two courses that make up this module are focused on that: how to make sense of what any information, or data, that we acquire is actually telling us (SToM) and practising how to work together to actually do something new, creative and explorative (the Summer Project).”

KEY POINTS

- 7.5 ECTS (1/8 th of first year!)
- ENTIRELY COURSEWORK!
- 30% Statistics of Measurement
Group Computational Project, Quiz, Seminars
- 70% Summer Project
Group Project, Presentation, Continuous Assessment

MEET THE MODULE TEAM




“Statistics is
equally important
to theorists and
experimentalists
alike.”
- Dr Mark Richards

YOUR MODULE LEADER SAYS

To Make the Most of SToM and The Summer Project You Should:

[This module follows on from Practical Physics, so do] try and absorb as much of that module as you can.

The Best Physics Joke Is:

A physicist who works on muon-to-electron conversion said to one who studies muon-neutrino-to-electron-neutrino oscillation: “What’s a bit of negativity between friends?”

You’ll Like SToM and The Summer Project Because:

It will help open you up to the other important aspect of Physics: human beings working together, now, to devise means of exploration that are new, and at the same time, rigorous and quantitative.



Prof Yoshi Uchida



yoshi.uchida@imperial.ac.uk

Dr Mark Richards

Lectures:

Statistics of Measurement (SToM)

Favourite Physics Joke:

How many theoretical physicists does it take to change a lightbulb?

Answer: Two, one to hold the bulb and the other to rotate the universe.

Before You Start:

If you've studied basic statistics or probability at school then it's worth giving it a quick review prior to starting the course.

Top Tip to Ace This Course:

The most effective way to engage with this course is quite simply to attend/view the lectures, read the accompanying notes (ideally in advance of the corresponding lecture), attempt the problems, and of course seek appropriate help/support where required (in other words do not 'suffer in silence').

Seminars are also really useful for nailing down some key concepts.

Words of Wisdom:

Rather than treating statistics as an abstract maths course, think of it more as a practical tool to use when wanting to ascribe uncertainties to experimental measurements or large data sets.



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MATHEMATICAL ANALYSIS

an ELECTIVE module

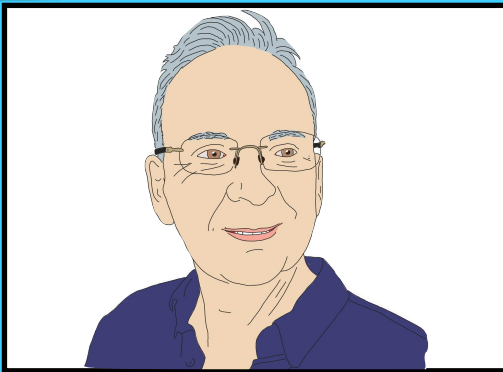
MODULE OVERVIEW

"It is about the culture of rigorous mathematics and how to turn vague but intuitively plausible arguments into rigorous proofs. It is also about the nature of infinity -- an intuitively appealing notion but one that doesn't really exist in rigorous mathematics. So how do we reconcile intuition with rigour?"

KEY POINTS

- 5 ECTS (1/12 th of first year!)
 - 100% Exam! (Term 3)
 - Taught through lectures and classwork sessions
 - Compulsory for Theory Students
- You must take this if you want to switch to a theory course too!

MEET THE MODULE TEAM



Prof Jonathan Haliwell

"There are some fun examples that really challenge the mathematical imagination."

- Prof Jonathan Haliwell

The Best Physics Joke Is:

Q: What is a topologist?

A: Someone who can't tell the difference between a doughnut and a coffee mug.

Before You Start:

The first term lecture courses give the requisite preparation.

Top Tip to Ace This Course:

The course is about problem solving and application of rigorous techniques so to make the most of it, attempt the problem sheets, classworks, old exam papers etc.

Words of Wisdom:

Think about reading some general books on mathematics, e.g. A Mathematician's Apology by G.H. Hardy, or What is Mathematics, by Courrant and Robins.

You can reach Prof Haliwell here:

✉ j.haliwell@imperial.ac.uk

ADVANCED ELECTRONICS

an ELECTIVE module

MODULE OVERVIEW

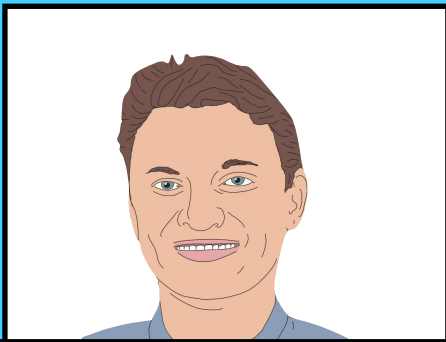
"Everyone needs to know how a transistor works, right? Surely the single most transformational physics-led invention of the last 100 years. Electronics is a practical subject, so we'll study this through experimental and computer-simulation labs, supported by lectures. The labs are tried, tested and highly developed to help you learn practical skills in a (hopefully) enjoyable way."



KEY POINTS

- 5 ECTS (1/12th of first year!)
- 100% Coursework! (Term 3)
- 85% Project Report & Interview
- 15% APS and Multiple Choice Quiz
- Lectures, Tutorials, Labs and computer-simulation classes

MEET THE MODULE TEAM



Mr Chris Carr



"Numbers on this course may be limited due to lab constraints, so choose early to avoid disappointment!"

-Mr Chris Carr

The Best Physics Joke Is:

More of a visual gag: Google "Gromit electronics for dogs" and hit the "images" tab. Like Gromit, we study electronics because it is an essential skill we need as physicists (a bit like we need to know maths and computing).

Before You Start:

If you want to prepare, we'll use LTSpice for circuit simulation (it's on the software hub), so you could get some advanced familiarity with using this. There are lots of tutorials online.

Top Tip to Ace This Course:

The order of the lectures, simulations and experimental labs has been carefully planned, so try to do things in the right sequence. Read the script before you start a lab - it helps build context and understanding.

Words of Wisdom:

Numbers on this course may be limited due to lab constraints, so choose early to avoid disappointment!

You can Reach Mr Carr here:

 c.m.carr@imperial.ac.uk

PRACTICAL PHYSICS

a COMPULSORY module

MODULE OVERVIEW

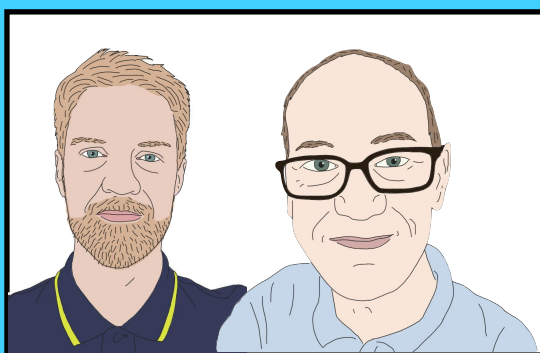
"Whether you enjoy playing with lab kit to observe physics in action or teasing the underlying physics from a set of data, the practical physics module has something for you. And on the way you will develop some of the most transferable skills from your degree including working together, data analysis and writing formal reports."



KEY POINTS

- 10 ECTS (1/6 th of first year!)
- 75% Coursework
(Computing Project, Lab Reports, Continuous Assessment)
- 25% Problem Solving Exam
(Tutorials start in Term 3)

MEET THE MODULE TEAM



"Computer programming is all about learning by doing."

-Dr Brian Appelbe

YOUR MODULE LEADER SAYS

To Make the Most of Practical Physics You Should:

Come to all your sessions and make sure you act on the feedback we give you.

The Best Physics Joke Is:

One atom to another

A: I think I'm an ion.

B: Oh dear! Are you sure?

A: Yes, I'm positive!

You'll Like Practical Physics Because:

Practical Physics includes lab, computing and problem solving. Lab is your chance to get hands on experience with research grade lab equipment, computing will introduce you to coding for physics in python and problem solving will introduce you to the crucial skills needed to solve physics "on the back of an envelope"! In this module you will start to develop the skills needed to become a professional physicists, including taking data using a variety of experimental methods, data analysis and modelling, experimental uncertainties, record keeping and report writing.

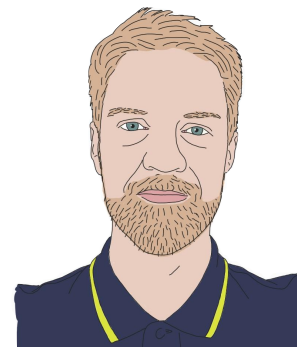


Prof Stuart Mangles



stuart.mangles@imperial.ac.uk

Dr Brian Appelbe



Lectures:

Computing

Favourite Physics Joke:

"Debugging is like being the detective in a crime novel in which you are also the murderer."

 b.appelbe07@imperial.ac.uk

Before You Start:

No preparation is necessary for this course. We will teach you all the basics that you need to know. If you have never done any coding/programming then do not worry - we do not expect you to have any previous experience. If you have done some programming then you will still learn new techniques for using computers to do Physics (e.g. data analysis, solving differential equations, etc).

Top Tip to Ace This Course:

Practice! Do all the exercises that you are given (and do them again if you need to). Remember that computer programming is a tool for learning physics! There is a huge variety of different programming languages, tasks that can be solved by computers, etc. In our case, we want to learn how to use computers to help us solve physics problems.

Words of Wisdom:

Try out new things. Programming is great because it is really easy to try different things. There are usually many different ways to write a program to carry out a task. You can try out one approach, test it and if it doesn't work then try a different approach. This would not be so easy if creating physical objects!

A Word About Programming:

There is a very large number of free resources online for learning Python. I do not recommend any specific resource but I would encourage you to explore for yourself. Knowing how to use online resources to learn new programming techniques and find solutions to your coding problems is an extremely important skill. It is something that all computer programmers, from beginners through to experts, need to be able to do! The lectures and computing laboratory sessions will cover all the basics that you will need, but it is essential that you learn how to develop your programming skills beyond what we cover.

Mr Rob Whisker and Mr Harish Dawda

Rob and Harish are the lab technicians. They provide day to day operational, practical and technical support to the teaching laboratories, and make sure that all your practical teaching sessions run smoothly. They were part of the team that created the award winning Lab-in-a-box, that was shipped to remote students last year.

Having a Fant-LAB-ulous Time

For many of you, it will be the first time you work in a professional physics laboratory, which might appear a bit intimidating. Not to worry! Every physicist must start somewhere, and you'll have some brilliant demonstrators to help you out along the way. You're likely to get stuck and make mistakes – but this will make you a better experimentalist. To ensure that you make the best possible start to your lab experience, here's a handy list of tips!

Safety First!

- There's no eating or drinking in labs. Not even water.
- Avoid using headphones and mobile phones (unless necessary) so that you are aware of what is always happening around you.
- Keep your area clear of trip hazards.
- Any incidents, breakages or 'near misses' need to be reported, regardless of how 'minor' they may seem. The department records these to improve procedures in labs.
- You'll find a risk assessment of your experiment prior to starting – **read this!**

The Lab Session

- You'll find a lab manual available to you prior to the experiment (uploaded onto Blackboard) – **read this!**
- While reading, ask yourself: Do you understand the theory behind the experiment? What is the reasoning behind the experimental setup? Does the methodology make sense?
- It might be useful to highlight and annotate the most important points in the lab manual.
- Start making notes in your lab book. This could be about the theoretical background of the experiment or any thoughts you may have about the experiment, e.g. reducing experimental uncertainty. Making notes before the lab session leaves more time to focus on the experiment!
- Is there anything else you can do in advance? If so, do it!
- If there's anything that's confusing to you, make a note of it. It's best to ask a demonstrator about it as soon as you can!
- Think about errors – they will form a hugely important part of your data analysis and conclusions. What steps are you taking to reduce them?
- Record your data in a sensible place. This is typically your lab book, but it could also be useful to record data in a spreadsheet – especially if you'll need to plot graphs later.

The Lab Session ctd

- Don't abandon your lab book!** It's easy to get wrapped up in the experiment once you see the setup and start taking measurements, but it is imperative that you take notes throughout. (More information about how to keep a good lab book can be found below.)
- Leave your lab area as you found it unless told otherwise.

Maintaining A Good Lab Book

- Record everything you do, as you do it!** Your lab book provides a clear and detailed account of your equipment, setup, procedures, results and conclusions – this is extremely useful when it comes down to writing a report!
- Everything needs to be in chronological order. Some of your experiments might span three lab sessions, so writing down dates and times makes it easy to see where you left off.
- Draw diagrams! Having annotated sketches of your experimental setup often ensures that you've correctly used all the equipment you've been given. You might also need sketches of what you see, e.g. what kind of fringes you observe in an interferometry experiment.
- Record your data here (this includes errors)!
- Include data plots with all the relevant information. Your lab book is the perfect place to record any conclusions you have reached by looking at your data.
- Write any additional thoughts you have. The lab manual is only a guide, and it isn't meant to constrain your thinking. The more you start thinking about underlying physics, the better you become as a physicist!

Frequently Asked Questions

Who Do I Go To If ...?

I have an IT/Computer Issue?

The ICT Service Desk can help with most issues.

Their website is <https://www.imperial.ac.uk/adminservices/ict/contact-ict-service-desk/>

You can also head to the Apple or Windows help bar in the Library (Level 1) if your personal computer is giving you trouble.

I need additional disability support?

The Disabilities Officer, Mery Fajardo.

I need extra language support?

Your Personal Tutor. They can help you identify any issues, and may refer you to the Centre for Academic English

<http://www.imperial.ac.uk/academic-English>.

I have been, or plan to be absent from College?

Inform the department of your absence by filling in an 'Absence Reporting Form' and talking to your personal tutor. If you are absent for more than five working days, you must inform the Senior Tutor (Dr. Ingo Mueller-Wodarg) .

I am having problems with accommodation?

Your personal tutor can discuss issues with you to help you find avenues of support and refer you to the Accommodation Office.

The Senior Tutor can also help identify the likely effect on your work.

I am having financial issues?

Your personal tutor can assist you in finding sources of funding and direct you to the Student Financial Support Office. If you find your studies are also being negatively impacted, you can contact Ingo to discuss filing a mitigating circumstances claim.

Frequently Asked Questions ctd

Who Do I Go To If ...?

I am having problems at Home?

Your personal tutor can discuss any concerns you have about your home life and provide advice. They may also refer you to Ingo if this is having a negative impact on your studies.

I am finding university stressful?

Your personal tutor can listen to your concerns and provide advice. You may prefer to contact the Student Counselling And Mental Health Advice Service for an appointment for further support.

I am having trouble with my study skills?

You can discuss your difficulties with the Student Liaison Officer (Dr. Yasmin Andrew) and work out a suitable plan that meets your needs.

I am having mental health issues?

You can seek support by booking an appointment with the Student Counselling and Mental Health Advice Service. You can also discuss your issues with your GP, who can refer you to the NHS mental health services as they see fit. As always, your personal tutor will always listen to your concerns and provide advice where they can.

I need a reference?

You can always ask your personal tutor for a reference – make sure to keep in touch with them so that they get to know you well across the duration of your studies!

Remember, if in doubt - **ask**.

We hope that you have an absolutely smashing time here, and make the most of it. Work hard, and enjoy yourself!

All the best,
Rebekah, Nabihah, Jessie and Amy :)