Introductory Maths Catalogue

This maths catalogue is designed to help you settle into your programme. Whether you are a maths student an engineer or studying the natural sciences this catalogue will tell you what maths you might expect to encounter in your year one modules and links to resources that will help you practice. Click on the buttons to the right to learn more about what is in the catalogue and the language that is used. Click on ‘Undergraduate Programmes’ to see what maths is in your course. Or click on ‘Maths Content’ to search for a specific concept.

How to use this catalogue

What is included?

Meet the Team

Undergraduate Programmes

Maths Content

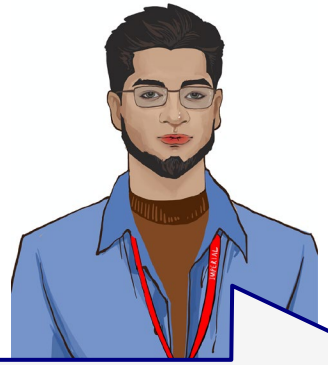
How to use this Catalogue

Click below to see August, a first-year maths student explain how to use the catalogue. And see how other students might use the catalogue to support them before they start and into their first year at Imperial. These characters are all part of the Animated Inclusive personae project. To find out more about her and to meet other personae visit the AIP website.

This is a pilot release so if you think anything is missing, have any feedback, or find something that is not working, please email aasc@imperial.ac.uk.

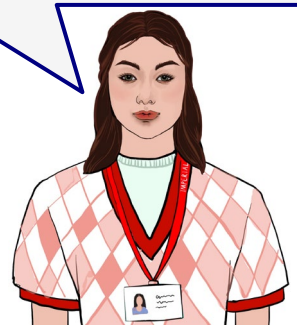
Hi, I am Rachel. I am one of the StudentShapers who worked on this project. When I started my course, I felt a bit lost because there was a lot of maths. I hope it helps!

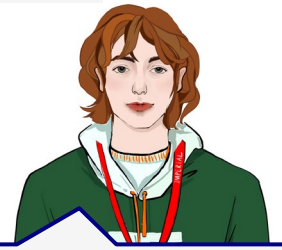
Hi I'm August I think this is a great resource. I made a video to help introduce you this resource.



Hi, I'm Ahmir, I come from Malaysia, and I use this catalogue to help me translate the concepts I learned in my own language into English.

Hi I'm Elena, I have dyslexia and dyspraxia, and this resource helps me plan what I need to do and find other resources to complement my studies.





Hi, my name is Andrew, and I studied for my A-levels at a college that did not offer further maths, so I am using this catalogue to fill in a few gaps.

What is included

This catalogue covers first year modules which have substantial mathematical content within them which is likely to be based on concepts taught in the UK A-level system. The terminology is typically that which is used in the UK educational system, but we are aware that many students come from different systems and have different primary languages. One of the aims of this catalogue is to help those students fill in any gaps caused by different systems or language barriers.

Some modules covering more advanced topics, such as mechanics, are not covered here as it is expected that they will be taught from scratch within your programmes. Nevertheless, the intro content in this catalogue will help you with the foundations of all maths.

Where programmes with multiple streams have identical year one modules they have been grouped together, for example Mechanical Engineering with Nuclear Engineering will be found under Mechanical Engineering. If you have a resource that you think should be included please email is at aasc@imperial.ac.uk.

Meet the Team

This catalogue was developed as part of a StudentShapers project as part of a wider College project called Animated Inclusive Personae. The project team of six is made up of three staff members and three students with a range of skills and backgrounds.

Katie Stripe – Senior Learning Designer. Working on inclusive learning projects across Imperial College.

Jack Kwok – 2nd Year Civil Engineering student from Hong Kong. In my free time, I enjoy playing badminton, cooking, and occasionally going camping.

Dr Phil Ramsden – Director of Cross Curricular Mathematics Education and a dynamicist by specialism. Working on outreach, visualisations and automated feedback.

Wonjun Choi - 3rd year Mathematics Student from South Korea. I love travelling and playing baseball!

Dr Sam Brzezicki – Senior Teaching Fellow for Outreach.

Madison Fernando – 3rd year biological sciences student from Paris. I love to travel, bake and take photos.

Imperial College Undergraduate Programmes

Faculty of Engineering

- Aeronautical Engineering
- Biomedical Engineering
- Biomedical Technology Ventures
- Molecular Bioengineering
- Chemical Engineering
- Civil Engineering
- Computing
- Design Engineering
- Electrical and Electronic/Information Engineering
- Geology
- Geophysics & Earth and planetary sciences
- Materials Science and Engineering
- Mechanical Engineering
- Joint Maths and Computing

Faculty of Natural Sciences

- Biochemistry, Biotechnology
- Biological Sciences, Ecology and Environmental Biology, Microbiology
- Chemistry
- Mathematics
- Physics

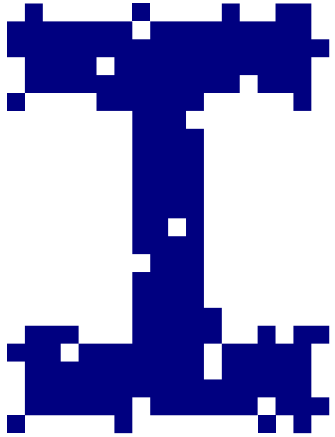
Business School

- Economics, Finance, and Data Science

Faculty of Medicine

- Medical Biosciences

Select your Programme to find out what maths you might encounter



Medical Biosciences

Included

MED140010
Integrative Body Systems

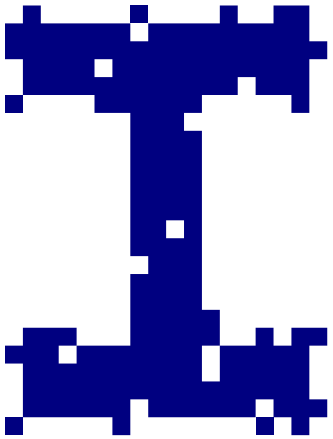
MED140011
Statistics

MED140012
Lab Pod 1

Not included

MED140008
Molecular and Cellular Biology

MED140009
Chemistry of Biological Interactions



MED140010 Integrative Body Systems

Arithmetic	Graphs
Scientific notation	Types of graphs
Significant figures	Linear graphs
Standard units	Linear regression
	Hyperbolic graphs and asymptotes

MED140011 Statistics

Arithmetic	Graphs	Probability
Scientific notation	Types of graphs	Probability of distribution
Significant figures	Linear graphs	Bayes rules
Standard units	Linear regression	
	Hyperbolic graphs and asymptotes	

MED140012 Lab Pod 1

Solving equations	Linear Algebra
Linear equations	Linear transformations

Aeronautical Engineering

Included

AERO40001
Aerodynamics 1

AERO40003
Computing and Numerical Methods 1

AERO40006
Mathematics 1

Not included

AERO40002
Introduction to Aerospace

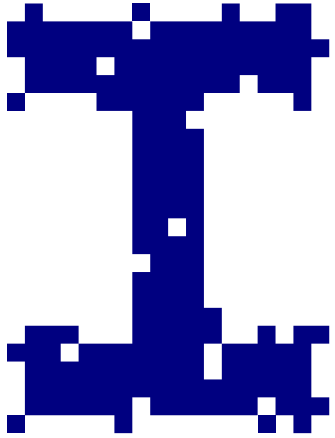
AERO40004
Engineering Practice 1

AERO40005
Materials 1

AERO40007
Mechanics

AERO40008
Structures 1

AERO40009
Thermodynamics and Heat Transfer



AERO40001 Aerodynamics 1

Differentiation 1

- Differentiation Rules
- Derivatives of simple functions
- Minima/maxima
- Chain rule

Integration 1

- Elementary Integration
- Elementary integration 2
- Definite vs indefinite
- Exponential and log functions

Arithmetic

- Scientific notation
- Significant figures
- Standard units

Algebra

- Algebraic expression
- Power, roots, and indices
- Quadratics
- Functions

Ordinary differential equations

- 1st order - Separation of Variables

Linear Algebra

- System of linear equations

Solving equations

- Linear equations
- Quadratic equations
- Simultaneous equations

Trigonometry

- Basic concepts
- Modelling

Functions

- Polynomials
- Exponential and log functions
- Combining functions

AERO40003 Computing and Numerical Methods 1

Arithmetic

- Scientific notation
- Significant figures
- Standard units

Algebra

- Algebraic expression
- Power, roots, and indices
- Negative and fractional powers
- Quadratics
- Series
- Functions

Solving equations

- Linear equations
- Quadratic equations

Graphs

- Types of graphs
- Linear graphs
- Linear regression

Functions

- Polynomials
- Exponential and log functions

Probability

- Probability of distribution

Trigonometry

- Basic concepts

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations
- Eigenvalues and Eigenvectors

Complex Numbers

- Cartesian Form

Logarithms

- The basics of logarithms

Integration 2

- Riemann Sum
- Definite Integrals & Area under the Curve

Numerical Methods

- Trapezium Rule and Newton-Raphson

Vectors

- Scalars

Power Series

- Maclaurin and Taylor Series

AERO40006 Mathematics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Complex Numbers

- Cartesian Form
- Polar Form

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Biomedical Technical Ventures

Included

BIOE40004

Mathematics 1

Not included

BIOE40002

Computer Fundamentals and Programming 1

BIOE40003

Design and Professional Practice 1

BIOE40011

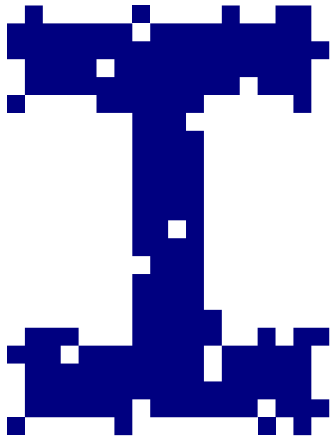
Foundations of Biomedical Engineering

BIOE40010

Medical and Biological Science 1

BIOE40014

Sensors and Actuation



Biomedical Engineering

Included

BIOE40004
Mathematics 1

BIOE40006
Mechanics and Electronics 1

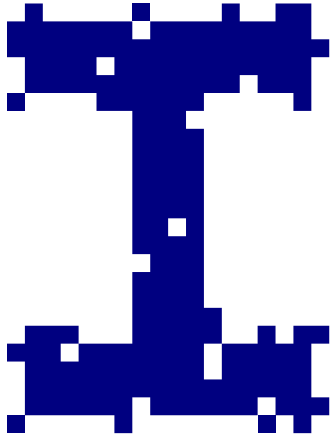
Not included

BIOE40001
Bioengineering Science 1

BIOE40002
Computer Fundamentals and Programming 1

BIOE40003
Design and Professional Practice 1

BIOE40010
Medical and Biological Sciences 1



Molecular Bioengineering

Included

BIOE40004
Mathematics 1

BIOE40005
Mathematics and Engineering 1

Not included

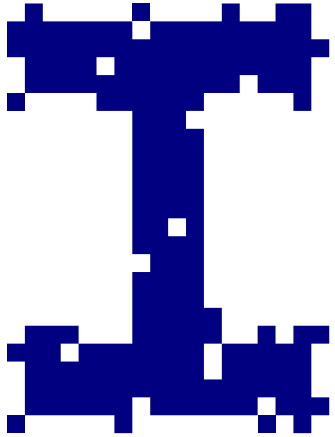
BIOE40002
Computer Fundamentals and Programming 1

BIOE40003
Design and Professional Practice 1

BIOE40010
Medical and Biological Science 1

BIOE40011
Foundations of Biomedical Engineering

BIOE40014
Sensors and Actuation



BIOE40004 Mathematics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes
- Relationship Between Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

BIOE40005 Mathematics and Engineering

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes
- Relationship Between Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

BIOE40006 Mechanics and Electronics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes
- Relationship Between Lines and Planes

Chemical Engineering

Included

CENG40005
Thermodynamics 1

CENG40007
Mathematics Fundamentals

CENG40008
Physical Chemistry

Not included

CENG40001
Mastery 1

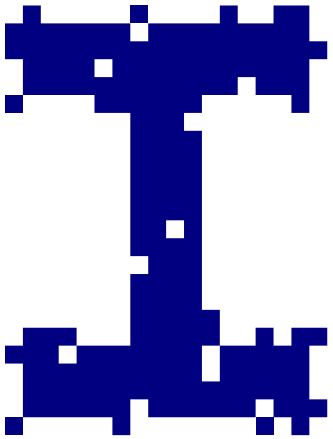
CENG40002
Process Analysis

CENG40003
Chemical Engineering Practice 1

CENG40004
Transfer Processes 1

CENG40006
Chemistry 1

CENG40009
Separation Processes 1



CENG40005 Thermodynamics 1

Differentiation 1

- Differentiation Rules

Integration 1

- Elementary Integration
- Elementary integration 2

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

CENG40007 Mathematics Fundamentals

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes
- Relationship Between Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

CENG40008 Physical Chemistry

Differentiation 1

- Differentiation Rules

Integration 1

- Elementary Integration
- Elementary integration 2

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Civil Engineering

Included

CIVE40003
Mathematics 1

CIVE40005
Mechanics

CIVE40006
Structural Mechanics 1

CIVE40008
Fluid Mechanics 1

Not included

CIVE40001
Professional Engineering Practice

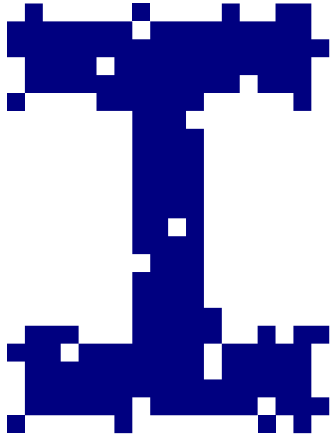
CIVE40002
Civil Engineering Design 1

CIVE40004
Computational Methods 1

CIVE40007
Materials

CIVE40009
Geotechnics

CIVE40010
Energy and Environmental Engineering



CIVE40003 Mathematics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

CIVE40005 Mechanics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

CIVE40006 Structural Mechanics 1

Differentiation 1

- Differentiation Rules

Integration 1

- Elementary Integration
- Elementary integration 2

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

CIVE40008 Fluid Mechanics 1

Differentiation 1

- Differentiation Rules

Integration 1

- Elementary Integration
- Elementary integration 2

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Computing

Included

COMP40016
Calculus

COMP40017
Linear Algebra

COMP40018
Discrete Mathematics, Logic and Reasoning

Not included

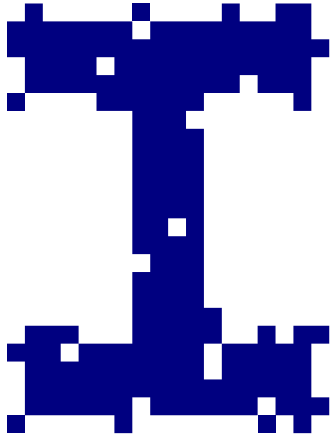
COMP40001
Introduction to Computer Systems

COMP40005
Introduction to Computer Architecture

COMP40007
Introduction to Databases

COMP40008
Graphs and Algorithms

COMP40012
Logic and Reasoning



COMP40016 Calculus

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Numerical Methods

- Trapezium Rule and Newton-Raphson

Power Series

- Maclaurin and Taylor Series

COMP40017 Linear Algebra

Matrices	Vectors
Operations	Introduction
Determinants	Dot and Cross Product
Inverse Matrices	Equations of 3D Lines and Planes
System of Linear Equations	
Matrix Transformations	
Eigenvalues and Eigenvectors	

COMP40018 Discrete Mathematics, Logic and Reasoning

Proof Methods

Proof by Induction and Contradiction

Disproof by Counterexample

Design Engineering

Included

DESE40001
Engineering Mathematics

Not included

DESE40002
Introduction to Design Engineering

DESE40003
Materials and Manufacturing

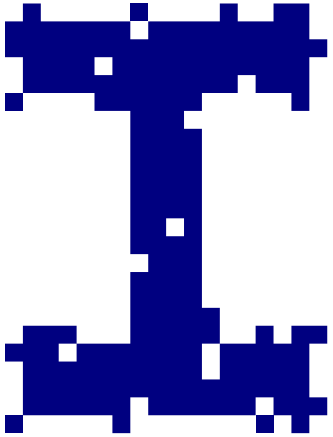
DESE40004
Human-Centred Design Engineering

DESE40005
Solid Mechanics 1

DESE40006
Electronics 1

DESE40007
Computing 1

DESE40009
Data Science



DESE40001 Engineering Mathematics

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Eigenvalues and Eigenvectors

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Electrical and Electronic/Information Engineering

Included

ELEC40012
Mathematics 1

Not included

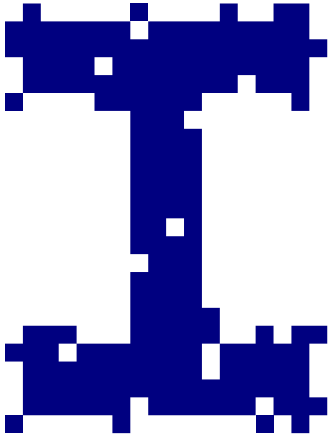
ELEC40002
Analysis and Design of Circuits

ELEC40003
Digital and Computer Architecture

ELEC40004
Programming for Engineers

ELEC40009
Topics in Electrical Engineering

Elena is a first-year student in EEE, she is dyslexic and dyspraxia which means she has some difficulties which are supported by the Disability Advisory Service. It also means she has strengths in areas such as big picture thinking and creativity. The Introductory Maths Catalogue helps Elena find resources that are more suited to the way she learns, like videos but it also helps her see the bigger picture and how the concepts she already knows link to her course.



Elena is part of the part the of the Animated Inclusive personae project. To find out more about her and to meet other personae visit the AIP website.

ELEC40012 Mathematics 1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Power Series

- Maclaurin and Taylor Series

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Matrices

- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Geology

Included

EART40005
Mathematics Methods 1

EART40013
Mathematics Methods 2

Not included

EART40001
Dynamic Earth and Planets

EART40002
Stratigraphy and Geomaterials

EART40003
Programming for Geoscientists

EART40008
Deforming the Earth

EART40009
Life over Deep Time

EART40010
Geology in the Field

EART40011
Physical and Surface Processes

Hi, I am Rachel. I am one of the StudentShapers who worked on this project. When I started my course, I felt a bit lost because there was a lot of maths. I did A-Level maths and I still found it hard, but there were some people on my course who didn't. We all spent a lot of time looking for resources on the web and I have shared them here so you can find them more easily. I hope it helps.

Rachel is part of the part the of the Animated Inclusive personae project. To find out more about her and to meet other personae visit the AIP website.

Geophysics, Earth and planetary sciences

Included

EART40005
Mathematics Methods 1

EART40013
Mathematics Methods 2

Not included

EART40001
Dynamic Earth and Planets

EART40002
Stratigraphy and Geomaterials

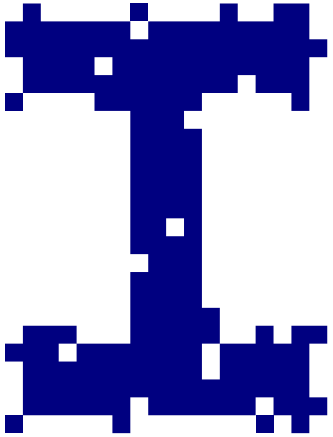
EART40003
Programming for Geoscientists

EART40008
Deforming the Earth

EART40010
Geology in the Field

EART40011
Physical and Surface Processes

EART40012
Volcanism and Internal Processes



EART40005/ EART40013 Maths methods 1 and 2

Differentiation 1

- Differentiation Rules
- Derivatives of simple functions
- Different rules
- Minima/maxima
- Slope and Notation
- Chain rule

Integration 1

- Elementary Integration
- Elementary integration 2
- Definite vs indefinite

Algebra

- Algebraic expression
- Power, roots, and indices
- Negative and fractional powers

Vectors

- Dot and Cross Product

Solving equations

- Linear equations
- Quadratic equations
- Simultaneous equations

Numerical Methods

- Trapezium Rule and Newton-Raphson

Functions

- Functions overview
- Inverse functions
- Polynomials
- Exponential and log functions
- Combining functions

Trigonometry

- Basic concepts
- Modelling

Material Science and Engineering

Included

MATE40001

Mathematics and Computing 1

Not included

MATE40002

Performance of Structural Materials

MATE40003

Engineering Practice 1

MATE40004

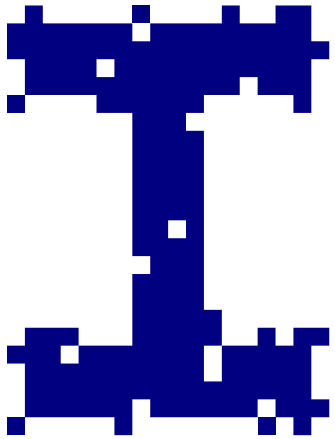
Structure 1

MATE40005

Fundamentals of Processing

MATE40006

Properties 1



MATE40001 Mathematics and Computing

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Numerical Methods

- Trapezium Rule and Newton-Raphson

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations
- Eigenvalues and Eigenvectors

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Complex Numbers

- Cartesian Form
- Polar Form

Power Series

- Maclaurin and Taylor Series

Mechanical Engineering

Included

MECH40002
Fluid Mechanics 1

MECH40003
Thermodynamics 1

MECH40005
Stress Analysis 1

MECH40008
Mathematics and Computing 1

MECH40009
Mechanics

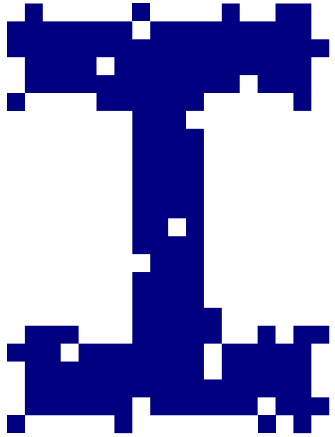
Not included

MECH40001
Professional Engineering Skills 1

MECH40004
Mechatronics 1

MECH40006
Materials 1

MECH40007
Design and Manufacture 1



MECH40002 Fluid Mechanics1

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations

Power Series

- Maclaurin and Taylor Series

MECH40003 Thermodynamics 1

Differentiation 1

- Differentiation Rules

Integration 1

- Elementary Integration
- Elementary integration 2

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

MECH40005 Stress Analysis 1

Differentiation 1
Differentiation Rules
Derivatives of simple functions
Different rules
Gradient expression
Sketching derivatives
Minima/maxima
Gradients and differentiation
Slope and Notation
Chain rule

Integration 1
Elementary Integration
Elementary integration 2
Finding integrals
Integrals of a constant
Definite vs indefinite
Exponential and log functions

MECH40008 Mathematics and Computing

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Numerical Methods

- Trapezium Rule and Newton-Raphson

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations

Power Series

- Maclaurin and Taylor Series

Complex Numbers

- Cartesian Form
- Polar Form

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

MECH40009 Mechanics

Differentiation 1

- Differentiation Rules
- Derivatives of simple functions
- Different rules
- Gradient expression
- Sketching derivatives
- Minima/maxima
- Gradients and differentiation
- Slope and Notation
- Chain rule

Integration 1

- Elementary Integration
- Elementary integration 2
- Finding integrals
- Integrals of a constant
- Definite vs indefinite
- Exponential and log functions

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Biochemistry, Biotechnology

Included

Maths for Biological Sciences

Ahmir is a first-year studying Biochemistry. He did really well in his Malaysian school exams, but he studied in Malay so even though he knows many of the concepts that are being taught he is not confident when translating them to English. His course does not have a maths module, but a lot of maths concepts are important to many of the modules that he is studying. The maths catalogue is really useful for him because it helps him to match up what he knows to what he is studying. The section on 'maths for biological sciences' helps him plan for his modules and keep on top of his workload.

Ahmir is part of the part the of the Animated Inclusive personae project. To find out more about him and to meet other personae visit the AIP website.

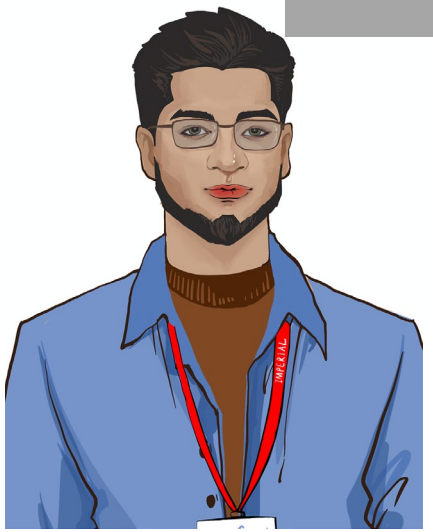
Not included

LIFE40001
Biological Chemistry

LIFE40002
Cell Biology

LIFE40003
Enzymes and Metabolism

LIFE40004
Molecular Biology



Biological Sciences, Ecology and Environmental Biology, Microbiology

Included

Maths for Biological Sciences

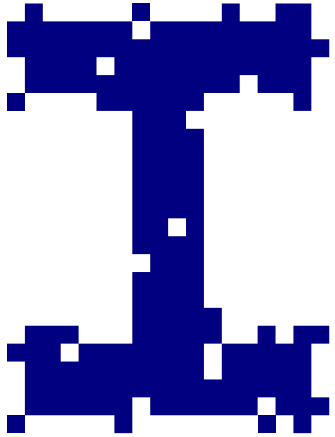
Not included

LIFE40005
Biological Chemistry and Microbiology

LIFE40006
Cell Biology and Genetics

LIFE40007
Ecology and Evolution

LIFE40008
Evolution and Diversity



Maths for Biological Sciences

Differentiation 1

- Differentiation Rules
- Derivatives of simple functions
- Different rules
- Gradient expression
- Sketching derivatives
- Minima/maxima
- Gradients and differentiation
- Slope and Notation

Integration 1

- Elementary Integration
- Elementary integration 2
- Finding integrals
- Integrals of a constant
- Definite vs indefinite
- Exponential and log functions

Logarithms

- The basics of logarithms
- Exponential decay
- Exponential and logarithms
- Power laws

Trigonometry

- Basic concepts
- Modelling

Graphs

- Types of graphs
- Linear graphs
- Linear regression
- Hyperbolic graphs and asymptotes

Arithmetic

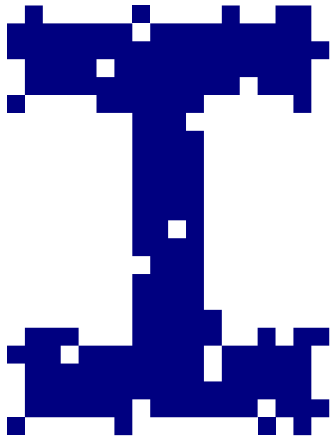
- Scientific notation
- Significant figures
- Standard units

Probability

- Probability of distribution
- Bayes rules

Algebra

- Algebraic expression
- Power, roots, and indices
- Negative and fractional powers
- Quadratics
- Series
- Functions



Chemistry

Included

CHEM40010

Mathematics and Physics 1

Not included

CHEM40002

Language of Chemistry

CHEM40003

Introduction to Spectroscopy

CHEM40004 Structure and Bonding: Atomic Structure to Molecular Orbitals

CHEM40005

Chemistry of the Elements: Hydrogen to Uranium

CHEM40006

Reactivity at Carbon Centres

CHEM40007

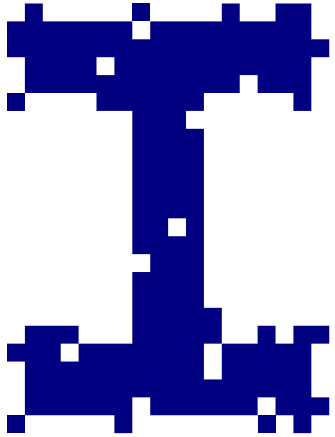
The Reaction Toolkit: Thermodynamics and Kinetics

CHEM40008

Practical Chemistry 1

CHEM40009

Medicinal Chemistry 1



CHEM40010 Mathematics and Physics 1

Graphs

- Types of graphs
- Linear graphs
- Linear regression
- Hyperbolic graphs and asymptotes

Linear Algebra

- Linear transformations
- System of linear equations
- Dot product
- Vector spaces

Probability

- Probability of distribution
- Bayes rules

Mathematics

Included

MATH40001
Introduction to University Mathematics

MATH40003
Linear Algebra and Groups

MATH40004
Calculus and Applications

MATH40005
Probability and Statistics

Not included

MATH40002
Analysis 1

MATH40006
Introduction to Computation

MATH40007
An Introduction to Applied Mathematics

August is a first-year maths student who works as a maths tutor to earn extra money. They have this advice for students studying maths. “To be well-prepared for the maths degree, I highly recommended you look at ‘*A Concise Introduction to Pure Mathematics’* by Martin Liebeck. It is a great book that provides a good introduction to pure mathematics which is something that most students never deal with in A levels or equivalent!”

August is part of the part the of the Animated Inclusive personae project. To find out more about them and to meet other personae visit the AIP website.

Joint Mathematics & Computing

Included

MATH40009
Introduction to University Mathematics

MATH40011
Calculus for JMC

MATH40012
Linear Algebra and Groups for JMC

Not included

COMP40008
Graphs and Algorithms

COMP40009
Computing Practical 1

MATH40010
Analysis for JMC

COMP40012
Logic and Reasoning

MATH40001/40009 Introduction to University Mathematics

Vectors	Proof Methods
Dot and Cross Product	Proof by Induction and Contradiction
Equations of 3D Lines and Planes	Disproof by Counterexample

MATH40003/40012 **Linear Algebra and Groups**

Linear Algebra	Matrices
Linear transformations	Intro to matrices
System of linear equations	Operations
Dot product	Determinants
Vector spaces	Inverse Matrices
	System of Linear Equations
	Linear equations and matrices
	Matrix Transformations
	Eigenvalues and Eigenvectors

MATH40004/40011 Calculus and Applications

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Numerical Methods

- Trapezium Rule and Newton-Raphson

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Power Series

- Maclaurin and Taylor Series

Polar Coordinates

- Conversion
- Curve Sketching

Complex Numbers

- Cartesian Form
- Polar Form

MATH40005 Probability and Statistics

Probability

- Probability of distribution
- Bayes rules

Physics

Included

PHYS40002
Mechanics and Relativity

PHYS40003
Oscillations and Waves

PHYS40007
Mathematical Analysis (elective)

Not included

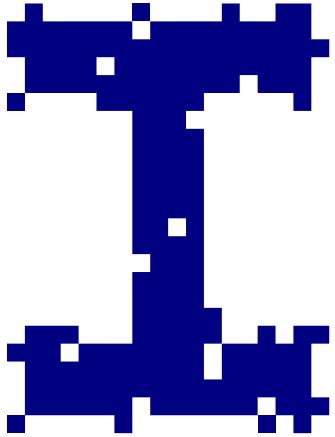
PHYS40001 Practical Physics: Laboratory, Computing and Problem Solving

PHYS40004
Vector Fields, Electricity and Magnetism

PHYS40006
Advanced Electronics

Andrew is about to start his BSc Physics at Imperial. He is a mature student and completed his A-levels over several years at a further education college while he was working. He will still be working when he starts at Imperial, and he wants to make sure he is as prepared as possible. He doesn't have A-level further maths because it wasn't offered at his college, so he is using the Introductory Maths Catalogue to make sure he has all the maths knowledge he needs to be able to keep up with his first-year courses. "Knowing what concepts will be taught in each module will really help me plan what I need to do"

Andrew is part of the part the of the Animated Inclusive personae project. To find out more about him and to meet other personae visit the AIP website.



PHYS40002 Mechanics and Relativity

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Polar Coordinates

- Conversion
- Curve Sketching
- Area Under Polar Curves

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Numerical Methods

- Trapezium Rule and Newton-Raphson

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations
- Eigenvalues and Eigenvectors

Power Series

- Maclaurin and Taylor Series

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

PHYS40003 Oscillations and Waves

Ordinary differential equations
1st order - Separation of Variables
1st order - Integrating Factor
2nd order - Ordinary differential equations

Complex Numbers
Cartesian Form
Polar Form

PHYS40007 Mathematical Analysis (Elective Module)

Proof Methods

- Proof by Induction and Contradiction
- Disproof by Counterexample

Economics, Finance and Data Science

Included

BUSI40001
Mathematical Foundations

BUSI40002
Probability and Statistics

Not included

BUSI40003
Introduction to Data Science

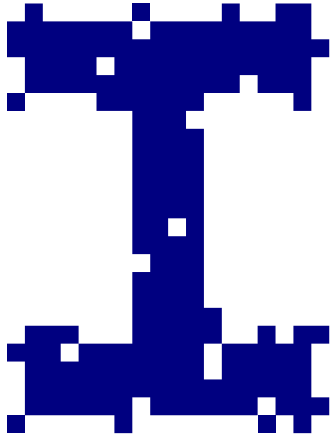
BUSI40004
Big Issues in Economics and Finance

BUSI40005
Accounting

BUSI40006
Microeconomics 1

BUSI40007
Macroeconomics 1

BUSI40008
Data Structures and Algorithms



BUSI40001 Mathematical Foundations

Differentiation 1

- Differentiation Rules

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 1

- Elementary Integration
- Elementary integration 2

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations
- Eigenvalues and Eigenvectors

Proof Methods

- Proof by Induction and Contradiction
- Disproof by Counterexample

Vectors

- Introduction
- Dot and Cross Product
- Equations of 3D Lines and Planes

Numerical Methods

- Trapezium Rule and Newton-Raphson

Power Series

- Maclaurin and Taylor Series

BUSI40002 Probability and Statistics

Probability

- Probability of distribution
- Bayes rules

Maths Content

The maths content covered in this catalogue has been split into categories to make the resources more manageable. These are in three broad groups ‘Introductory or refresher maths’ which covers concepts that could be useful for anyone at Imperial. Intermediate maths covering content that will be useful for those studying maths, physics, chemistry and engineering and a section specific to differentiation and integration which is a significant part relevant to most programmes. Click on the boxes to the right to learn more.

Introductory or Refresher Maths

Intermediate maths

Differentiation and Integration

Introductory or Refresher Maths

Arithmetic

- Scientific notation
- Significant figures
- Standard units

Algebra

- Algebraic expression
- Power, roots, and indices
- Negative and fractional powers
- Quadratics
- Series
- Functions

Graphs

- Types of graphs
- Linear graphs
- Linear regression
- Hyperbolic graphs and asymptotes

Logarithms

- The basics of logarithms
- Exponential decay
- Exponential and logarithms
- Power laws

Solving equations

- Linear equations
- Quadratic equations
- Simultaneous equations

Functions

- Functions overview
- Inverse functions
- Polynomials
- Exponential and log functions
- Combining functions

Linear Algebra

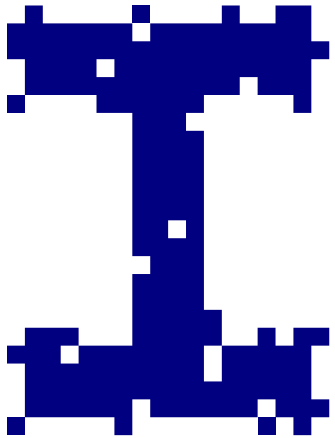
- Linear transformations
- System of linear equations
- Dot product
- Vector spaces

Trigonometry

- Basic concepts
- Modelling

Probability

- Probability of distribution
- Bayes rules



Intermediate maths

Matrices

- Intro to matrices
- Operations
- Determinants
- Inverse Matrices
- System of Linear Equations
- Linear equations and matrices
- Matrix Transformations
- Eigenvalues and Eigenvectors

Vectors

- Introduction
- Scalars
- Dot and Cross Product
- Equations of 3D Lines and Planes
- Relationship Between Lines and Planes

Proof Methods

- Proof by Induction and Contradiction
- Disproof by Counterexample

Hyperbolic Functions

- Properties and Graphs
- Derivatives and Integrals
- Inverse Hyperbolic Functions

Power Series

- Maclaurin and Taylor Series

Polar Coordinates

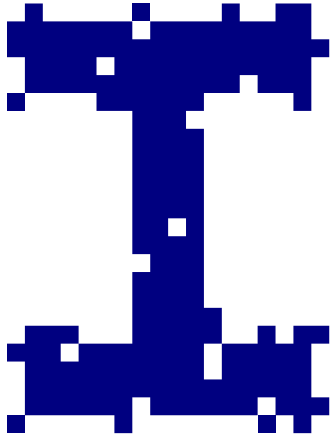
- Conversion
- Curve Sketching
- Area Under Polar Curves

Ordinary differential equations

- 1st order - Separation of Variables
- 1st order - Integrating Factor
- 2nd order - Ordinary differential equations

Complex Numbers

- Cartesian Form
- Polar Form



Differentiation and Integration

Differentiation 1

- Differentiation Rules
- Derivatives of simple functions
- Different rules
- Gradient expression
- Sketching derivatives
- Minima/maxima
- Gradients and differentiation
- Slope and Notation
- Chain rule

Integration 1

- Elementary Integration
- Elementary integration 2
- Finding integrals
- Integrals of a constant
- Definite vs indefinite
- Exponential and log functions

Numerical Methods

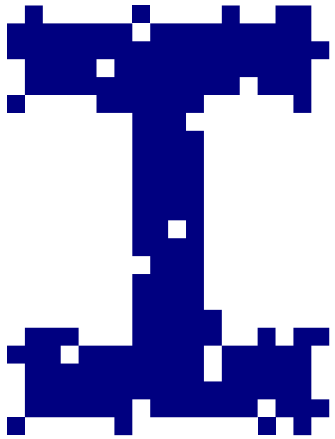
- Trapezium Rule and Newton-Raphson

Differentiation 2

- Limits
- Implicit Differentiation
- Optimization
- Sketching
- Parametric Functions

Integration 2

- Riemann Sum
- Integration Techniques
- Trigonometric and Hyperbolic Substitution
- Definite Integrals & Area under the Curve
- Parametric Integration
- Volume of Revolution



Solving equations - Quadratics equations

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Concepts	Refresher on solving quadratic operations	
The GCSE Maths Tutor	Video	Concepts	Solving quadratic equations by factorising	24 min
revisionmaths	Website	Concepts and examples with videos	Intro to quadratics	
BBC Bitesize	Website	Concepts	Refreshers on order of operations	

Solving equation – Simultaneous equations

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Concepts and examples	Intro to simultaneous equations	
Third Space Learning	Website	Concepts, examples and exercises	Simultaneous equations and how to solve them	
Tecmath	Video	Concepts	Simultaneous equation intro	19 min
Math Centre	PDF document	Method	How to solve simultaneous equations	2 pages
Whiteboard Maths	Video	Concepts	Solving simultaneous equations by substitution	5 min
Pearson	PDF document	Examples and exercises	Solving linear simultaneous equations by substitution	3 pages

Functions – Functions overview

Resource	Type	Content	Description	Length
Math Centre	PDF document	Concepts, examples and exercises	Intro to functions, how to graph them and when they are valid	13 pages
The GCSE Maths Tutor	Video	Concepts	Inverse functions	11 min
The GCSE Maths Tutor	Video	Concepts	Composite functions	12 min
BBC Bitesize	Website	Concepts and examples	Determining composite and inverse functions	
MME Revise	Website	Concepts with explanation videos, exercises and examples	Overview of functions	

Functions – Inverse functions

Resource	Type	Content	Description	Length
Save My Exams	Website	Revision style notes	Inverse functions	
alevelmaths.co.uk	Website	More in depth concepts	Inverse function: composition, graphing, definition, domain and range	
Khan Academy	Website	Concepts and examples	Intro to inverse functions	
The Organic Chemistry Tutor	Video	Concepts	How to find the inverse of a function	11 min
The Organic Chemistry Tutor	Video	Concepts	Covering the basics of inverse functions	23 min

Functions – Polynomials

Resource	Type	Content	Description	Length
Study Well	Website	Concepts with explanation video, examples and exercises	Exploring polynomials	
Khan Academy	Website	Concepts with explanation videos, exercises and examples	Subtopics: intro to polynomials, adding/subtracting polynomials, multiplying polynomials	
BBC Bitesize	Website	Recap of concepts and examples	Dividing and factorising polynomial expressions	

Functions – Exponential and log functions

Resource	Type	Content	Description	Length
Libre Texts	Website	More in depth concepts and examples	Log functions and how to use them	
Spark Notes	Website	Concepts	Log functions	
Math Centre	PDF document	Concepts, examples and exercises	The relationship between exponential and log functions	11 pages
The Organic Chemistry Tutor	Video	Concepts	Graphing log functions	12 min
The Organic Chemistry Tutor	Video	Concepts	Graphing exponential functions	10 min

Functions – Combining functions

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts, examples and exercises	Intro to combining functions	
Study Smarter	Website	Concepts, examples and exercises	How to combine functions	
Third Space Learning	Website	Concepts, examples and exercises	Composite functions	
The Organic Chemistry Tutor	Video	Concepts	Intro to composite functions	5 min
The Organic Chemistry Tutor	Video	Concepts	Covering the basics of composite functions	30 min

Linear algebra - Linear transformations

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts, examples and exercises	Various subtopics of matrix transformations	
Libre Texts	Website	Concepts and examples	Intro to linear transformations and theorems	
Physics and Maths Tutor	PDF document	Worksheet with practice questions and answers	Linear transformations	22 pages
Isaac Physics	Website	Concepts, exercises and worked examples	Matrices and linear transformations in two dimensions: rotations, creating and identifying them	
3 Blue 1 Brown	Video	Concepts	Linear transformations and matrices	11 min

Linear algebra – System of linear equations

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts explanation videos, exercises and examples	How to solve systems of linear equations	
Libre Texts	Website	Concepts, exercises and examples	Systems of linear equations with two variables	
Lumen Learning	Website	Concepts with explanation videos	Identify and solve a system	
The Lazy Engineer	Video	Concepts	Systems with matrices	7 min

Linear algebra - Dot products

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts, examples and exercises	Intro to dot products	
CUEMATH	Website	In depth concepts	Applications and definitions of dot products	
3 Blue 1 Brown	Video	Concepts	Dot products and duality	14 min
The Organic Chemistry Tutor	Video	In depth breakdown of concepts	Dot product of two vectors	35 min
Professor Dave Explains	Video	Concepts	The vector dot product	7 min

Linear algebra - Dot products

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts, examples and exercises	Intro to dot products	
CUEMATH	Website	In depth concepts	Applications and definitions of dot products	
3 Blue 1 Brown	Video	Concepts	Dot products and duality	14 min

Linear algebra - Dot products

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	In depth breakdown of concepts	Dot product of two vectors	35 min
Professor Dave Explains	Video	Concepts	The vector dot product	7 min

Linear algebra - Vectors spaces of functions

Resource	Type	Content	Description	Length
Deep Mind	Website	Concepts and examples	Function spaces	
Libre Texts	Website	examples	Showcasing how vector spaces work	
UCL	Website	Recap of concepts	Vector spaces	
Khan Academy	Website	Concepts explanation videos, exampless and exercises	Vectors, subspaces and the basis for a subspace	

Trigonometry – Basic concepts

Resource	Type	Content	Description	Length
Revision Maths	Website	Concepts	Sine/cosine/tan, Pythagorean, solving basic equations, compound angles, radians	
Save My Exams	Website	Revision style notes and explanation video	Trigonometry definitions	
The CGSE Maths Tutor	Video	Concepts	Covering trigonometric identities and equations	40 min
Physics and Maths Tutor	Website	Cheat sheets	Identities, ratios, radians, functions and modelling	
Khan Academy	Video	Concepts	Intro to the Pythagorean theorem	11 min

Trigonometry - modelling

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	Concepts	How to graph trigonometric functions	22 min
Flexbooks	Website	Concepts, examples and exercises	Modelling periodic behaviour	
Libre Text	Website	Concepts, examples and exercises	Modelling with trigonometric functions	

Probability - Probability of distribution

Resource	Type	Content	Description	Length
scribbr	Website	In depth concepts and examples	Formulas and types of probability distribution	
Third Space Learning	Website	Concepts, exercises and examples	Probability of distribution	
Khan Academy	Video	Concepts	Constructing a probability distribution for random variable	
365 Data Science	Video	Concepts	Types of distributions	7 min

Probability - Bayes rules

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts	The fundamentals of bayes theorem	6 min
James v Stone	Website	Concepts and practical examples	Intro to bayes theorem and how to use it	
3Blue 1Brown	Video	Concepts	Bayes theorem and practical example	15 min
Dr Trefor Bazett	Video	Concepts and methods breakdown	Quick recap on Bayes theorem	5.30 min

Logarithms - The basics

Resource	Type	Content	Description	Length
Math Centre	Website	Concepts, examples and exercises	Intro to logs and their laws	
Spark Notes	Website	Concepts	Quick recap on logarithmic functions	

Logarithms - Exponential decay

Resource	Type	Content	Description	Length
Save My Exams	Website	Revision note style	Exponential growth and decay	

Logarithms - Exponentials and logs

Resource	Type	Content	Description	Length
Revision maths	Website	Concepts and examples	Intro to the exponential function, laws of logs and natural logs	
Save My Exams	Website	Revision styles notes	Laws of logarithms	
MME Revise	Website	Recap of concepts with examples and questions	The relationship between exponentials and logs	

Logarithms - Power laws

Resource	Type	Content	Description	Length
Libre Texts	Website	Concepts, examples and exercises	Log rules, expanding and condensing log expressions, change-of-base formula	
Lumen	Website with video	Recap on concepts, examples and summary	Quotient and power rule recap	
alevelmaths.co.uk	Website	Recap of concepts and exampless	Laws of indices	

Graphs – Types of graphs

Resource	Type	Content	Description	Length
Third Space Learning	Website	Content, worked examples and practice questions	Recognising types of graphs	
Save My Exams	Website	Revision style notes	Types of graphs	
Physics and Maths Tutor	PDF document	Worksheet with topic notes	Linear, Quadratic, Cubic and Reciprocal graphs	10 pages

Graphs – Linear graphs

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Concepts	How to plot a linear graph	
Third Space Learning	Website	Concepts and examples	Intro to linear graphs	

Graphs – Linear regression

Resource	Type	Content	Description	Length
Newcastle University	Website	Concepts, worked examples and videos	Intro to simple linear regression	
Revision World	Website	Concepts and worked examples	Scatter diagrams and regression lines	
Physics and Maths Tutor	PDF document	Concepts and examples	Cheat sheet on linear regression	1 page

Graphs – Hyperbolic graphs and asymptotes

Resource	Type	Content	Description	Length
Save My Exams	Website	Revision style notes	Hyperbolic functions and graphs	
Maths Centre	PDF document	Concepts and exercise	Trigonometric functions and hyperbolic functions	
The Organic Chemistry Tutor	Videos	Concepts and exampless	The graphs of hyperbolic graphs and asymptotes	24 min

Arithmetic - Scientific notations

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Short revision style notes	Quick recap on the standard form	
Third Space Learning	Website	Concepts with videos, examples and exercises	Intro to standard form and how to calculate with it	
Advance ICT info	Website	Standard form calculator	For practice	
MME Revision	Website	Concepts with videos, exercises and exampless	More in depth standard form revision	

Arithmetic - Significant figures

Resource	Type	Content	Description	Length
Third Space Learning	Website	Concepts with worked examples and questions	Intro to significant figures and how to round with them	
BBC Bitesize	Website	Short revision style notes	Brief recap on how to round to significant figures	
My GCSE Science	Website	Brief overview of concepts and examples	Recap on decimal places and significant figures	
The Organic Chemistry Tutor	Video	Concepts	Review on significant figures	15 min

Arithmetic - Standard units

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Revision style notes, concepts	Recap on how to use units	
Libre Text	Website	Method explanation	Using conversion factors to change units	
Khan Academy	Video	Concepts	Intro to dimensional analysis	6 min
The Organic Chemistry Tutor	Video	Concepts and exampless	Dimensional analysis and conversion factors	15 min

Algebra – Algebraic expression

Resource	Type	Content	Description	Length
Third Space Learning	Website	Worksheet	Practice problems on algebraic expressions	
Khan Academy	Website	Concepts with explanation videos, and practice questions	Intro to variables, substitution and evaluating expressions	
BBC Bitesize	Website	Concepts, questions and examples	Simplifying expressions	

Algebra - Power, roots, and indices

Resource	Type	Content	Description	Length
Third Space Learning	Website	Concepts, examples and practice questions	Recap of powers and roots	
Save My Exams	Website	Revision style notes	Power, roots and indices	
BBC Bitesize	Website	Quick recap of concepts	Estimating powers and concepts	
MME Revise	Website	Explanation videos, examples and practice questions	Laws of powers and roots	
Cognito	Video	Concepts	Intro to 3 basic rules of powers and indices	6 min
Libre Texts	Website	Concepts, worked examples and exercises	Intro to exponents and roots	
Khan Academy	Website	Concepts, worked examples, exercises and quizzes	Exponent properties, radicals, simplifying roots	
Math Centre	Pdf document	In depth content	Exponentiation and logarithm function	11 pages

Algebra - Negative and fractional powers

Resource	Type	Content	Description	Length
B28 Maths Tutor	Website	Recap of concepts, practical examples and practice questions	Essentials of GCSE knowledge on fractional indices	
Spark Notes	Website	Concepts and examples	Negative and fractional exponents	
Third Space Learning	Website	Concepts, examples and practice questions	Fractional indices	
Khan Academy	Video	Concepts	Evaluating fractional exponents	3 min
Khan Academy	Video	Concepts	0, negative and fractional exponents	

Algebra- Functions

Resource	Type	Content	Description	Length
The GCSE Maths Tutor	Video	Concepts	Composite functions	12 min
BBC Bitesize	Website	Concepts	Quick intro to composite functions	
MME Revise	Website	Worksheets, examples and videos	Evaluating function, composite and inverse functions	
Third Space Learning	Website	Concepts, worked examples	How to use functions and their notations	
Math Centre	PDF document	Concepts, worked examples	Introduction to functions	13 pages
Tablet Class Math	Video	Concepts	Exponentiation and logarithm function	7 min

Algebra- Quadratics

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Concepts	Refresher on solving quadratic operations	
The GCSE Maths Tutor	Video	Concepts	Solving quadratic equations by factorising	24 min
Revision Maths	Website	Concepts and examples with videos	Intro to quadratics	
BBC BItesize	Website	Concepts	Refreshers on order of operations	

Algebra- Series

Resource	Type	Content	Description	Length
Revision Maths	Website	Concepts and worked examples	Series and sequences	
Physics and Maths Tutor	Website	Worksheets and practice papers with answers and videos	Series and sequences, Binomial expansion	
The Organic Chemistry Tutor	Video	Concepts	Geometric series	31 min
The Organic Chemistry Tutor	Video	Concepts	Binomial series	45 min

Ordinary differential equations – 1st Order Separation of Variables

Resource	Type	Content	Description	Length
SFU	Website	Concept, Worked Examples, Exercises	Method of separation of variables	
Dr. Luke's Lectures	Video	Concept, Worked Examples	Method of separation of variables	15 mins
Dr. Trefor Bazett	Video	Concept, Worked Examples	Method of separation of variables	10 mins

Ordinary differential equations – 1st Order Integrating Factors

Resource	Type	Content	Description	Length
HELM Workbook	Website	Concept, Worked Examples including videos	Method of integrating factors	
HoustonMathPrep	Video	Concept, Worked Examples	Method of integrating factors	12 mins

Ordinary differential equations – 2nd Order Homogeneous and Inhomogeneous

Resource	Type	Content	Description	Length
HELM Workbook	Notes	Concepts, worked examples, and exercises	Both homogenous and non-homogenous ODEs	21 pages
Engineers Academy	Video	Concept and worked examples	Homogenous ODEs	33 minutes
Engineers Academy	Video	Concept and worked examples	Inhomogeneous ODEs	25 minutes

Complex Numbers - Cartesian Form

Resource	Type	Content	Description	Length
MathIsFun	Website	Concept, worked examples, and exercises	Definition, properties, and Basic Operations with complex numbers	
University of Manitoba	PDF Notes	Concept, worked examples, and exercises	Definition, properties, Basic Operations, and Argand diagram	6 pages
HELM Workbook	PDF Notes	Concept, worked examples and exercises	Definition, properties, Basic Operations	Pg 2-14 (13 pages)
The Organic Chemistry Tutor	Video	Concepts and worked examples	Definition, modulus, and Argand diagram	14 minutes

Complex Numbers - Polar Form

Resource	Type	Content	Description	Length
LibreTexts	Website	Concept, worked examples, and exercises	Complex numbers in Polar Form, De Moivre's Theorem	
HELM Workbook	Notes	Concept, worked examples and exercises	Complex numbers in Polar Form, De Moivre's Theorem	Pg 15-34 (20 pages)
John Rossiter	Video	Concept, worked examples	Expressing Complex numbers in Polar Form(Exponential)	11 mins
SkanCity Academy	Video	Concept, worked examples	Expressing Complex numbers in Polar Form	13 mins
PatrickJMT	Video	Concept, worked examples	De Moivre's theorem and its useful application in finding powers of complex numbers	2 mins, 12 mins

Hyperbolic Functions – Properties and Graphs

Resource	Type	Content	Description	Length
Math Centre	PDF Notes	Concepts and exercises	Definitions, graphs, and identities	10 pages
The Organic Chemistry Tutor	Video	Concepts	Definition and simple graphs	10 minutes
The Organic Chemistry Tutor	Video	Concepts	Graphing hyperbolic trigonometric functions	23 minutes
Dr. Trefor Bazett	Video	Concept	Hyperbolic trig functions	16 minutes

Hyperbolic Functions – Derivatives and Integrals

Resource	Type	Content	Description	Length
Lamar	Website	Concepts (formulas) and exercises	Definition of derivatives only with brief proof	
Lumen Learning	Website	Concepts, worked examples, and exercises	Definition of derivatives, integrals, and calculus with inverse trig functions, brief proofs	
The Organic Chemistry Tutor	Video	Concepts (formulas) and worked examples	Definition of derivatives (no proofs) and examples of differentiating with hyperbolic trig	10 minutes
The Organic Chemistry Tutor	Video	Concepts (formulas) and worked examples	Definition of integrals (no proofs) and examples of integrating with hyperbolic trig	8 minutes

Hyperbolic Functions – Inverse

Resource	Type	Content	Description	Length
Metric	Website	Concepts and exercises	Derivation of inverse hyperbolic sine and cosine. Inverse Tan left as an exercise	
Geeks for Geeks	Website	Concepts and worked examples	Proofs of all inverse hyperbolic trig functions and examples of applications	
The Organic Chemistry Tutor	Video	Concepts (formulas) and worked examples	Defined formula for inverse hyperbolic trig functions and how to evaluate them	9 minutes
Mathsaurus	Video	Concepts	Proof of formulas	9 minutes

Polar Coordinates - Conversion

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	Concept and worked examples	Quick intro, conversions, and general equations	22 minutes
Math Centre	PDF Notes	Concepts, worked examples, exercises	Quick intro, conversions, and general equations	11 pages
LibreTexts	Website	Concepts and worked examples	Introductory intro, conversions, plotting, and general equations	

Polar Coordinates – Curve Sketching

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	Concepts and worked examples	Graphing polar equations	20 minutes
Lumen Learning	Website	Concepts, worked examples, and exercises	Graphing polar equations and understanding of symmetry	
Dr. Trefor Bazett	Video	Concepts and worked examples	Graphing polar equations	9 minutes

Polar Coordinates – Area Under Polar Curves

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	Worked examples	Area enclosed between polar curves	33 minutes
Lamar	Website	Concept and worked examples	Area enclosed under polar curves	
JK Maths	Video	In-depth concept explanation and worked examples	Area enclosed under polar curves	47 minutes

Proof Methods - Proof by Induction and Contradiction

Resource	Type	Content	Description	Length
Proof by Induction | Nrich University of Cambridge	Website	Concept, Worked Examples and Exercises	Proof by induction	
Proof by Induction | Khan Academy	Video	Concept with Introductory worked example	Proof by induction	9 mins
Proof by Contradiction | Nrich University of Cambridge	Website	Concept, Worked Examples	Proof by contradiction	
Proof by Contradiction | ExamSolutions	Video	Concept, Worked Examples	Proof by contradiction	14 mins

Proof Methods - Disproof by Counterexample

Resource	Type	Content	Description	Length
A Level Maths	Website	Concept, Worked Examples	Disproof by counterexample	
SnapRevise	Video	Concept, Worked Examples	Disproof by counterexample	12 mins

Vectors - Introduction

Resource	Type	Content	Description	Length
Introduction to Vectors | Math Centre	PDF Notes	Concepts, worked examples, and exercises	Vector definition and properties, position vectors, unit vectors	10 Pages
Basics of Vectors and Cartesian Components of Vectors | HELM Workbook	PDF Notes	Concepts, worked examples, and exercises	Vector definition and properties, position vectors, unit vectors, with physics applications	Pg 2-29 (28 pages)
Introduction to Vectors | Math Insight	Website	Concepts	Basic Operations and properties of vectors	
Introduction to Vectors | Professor Dave Explains	Video	Concepts, worked examples, and exercises	Vector properties, Basic Operations, unit vectors, and algebraic manipulations	10 minutes
Introduction to Vectors | Textbook Tactics	Video	Concepts and some worked examples	Basic Operations, magnitude, unit vector, and position vectors	21 minutes

Vectors – Dot and Cross Product

Resource	Type	Content	Description	Length
Dot and Cross Product | Joseph Breen	PDF Notes	Concept only	Dot product, cross product, properties and applications including projections and shortest distances with extensions	12 pages
Dot (Scalar) and Cross Product | HELM Workbook	PDF Notes	Concept, worked examples and exercises	Dot and Cross Products, including engineering examples	Pg 30-53 (24 pages)
Dot and Cross Product | LibreTexts	Website	Concept and worked examples	Dot product, cross product, relation to physics (work and torque)	
Vector Dot Product | Professor Dave Explains	Video	Concept, worked example, and exercises	Dot product, orthogonal properties	7 minutes
Vector Cross Product | Professor Dave Explains	Video	Concept, worked example, and exercises	Cross product and properties	7 minutes

Vectors – Equations of 3D Lines and Planes

Resource	Type	Content	Description	Length
Michel Van Biezen	Video Playlist	Concepts and worked examples	Equations of lines and planes in 3D, determining intersection	51 minutes
Paul's Online Notes	Website	Concepts and worked examples	Vector, parametric, and symmetric equation of a line	
Lamar	Website	Concepts and worked examples	Equation of a plane	
Harvard	PDF Notes	Concepts, worked examples, and exercises	Equations of a line and a plane	6 pages
The Organic Chemistry Tutor	Video	Concepts and worked examples	Vector, parametric, and symmetric equations of a line	12 minutes
The Organic Chemistry Tutor	Video	Concepts and worked examples	Equation of a plane	8 minutes
Math with Ms. Ruddy	Video	Concepts and worked examples	Summary of equation of lines and planes	14 minutes

Vectors – Types of lines and intersection points

Resource	Type	Content	Description	Length
LibreTexts	Website	Concept and worked examples	Parametric, symmetric, and vector equations	
Brian Mulholland	Video	Concept and worked examples	Parallel, skew, and intersecting lines	11 minutes
Learning Lab RMIT	Website	Concept, worked examples, and exercises	Point of intersection of lines	
Ben Loves Maths	Video	Worked example	Point of intersection of lines	6 minutes
LibreTexts	Website	Worked example	Intersection between a line and a plane	
The Organic Chemistry Tutor	Video	Concept and worked examples	Intersection between a line and a plane	10 minutes
Radford Mathematics	Video	Concept and worked example	Intersection line between planes	8 minutes
House of Math	Website	Concept and worked example	Line of intersection	

Vectors – Shortest distances between parallel lines and summary

Resource	Type	Content	Description	Length
TLMaths	Video	Worked examples	Distance between two parallel lines	6 minutes
MathsPanda	PDF Notes	Concept and worked example	Distance between parallel and skew lines summary	

Vectors – Scalars

Resource	Type	Content	Description	Length
Khan Academy	Website	Video	Intro to vectors and scalars	9 min
Seneca Notes	Website	Concepts	Scalars and vectors	
Save My Exams	Website	Revision style notes	Scalars and vectors	

Matrices - Intro to matrices

Resource	Type	Content	Description	Length
Coventry University	Website	Worksheets with answers and brief recaps of contents	Recommended: intro to matrices, and multiplication	
Khan Academy	Video	Concepts	Solving a system of 3 equations and four variables using matrix	18 min
Khan Academy	Website	Concepts, worked examples and exercises	Matrix transformations	
The Organic Chemistry Tutor	Video	Concepts	Intro to matrices	11 min
Postcard Professor	Video	Concepts	Matrix operations	7 min
Advance ICT	Website	For practice	Matrix Calculator	

Matrices - Operations

Resource	Type	Content	Description	Length
Matrix Definition Basic Operations | LibreTexts	Website	Concepts, worked examples, and simple exercises	Introduction of matrix Basic Operations (addition, multiplication, scalars)	
Matrix Definition, Types, and Basic Operations | Lafayette	PDF Notes	Concepts and worked examples	Definition of matrix types, Basic Operations, goes into additional linear combinations and trace	10 pages
Matrix Definition and Basic Operations | Postcard Professor	Video	Concepts taught through worked examples	Definition, transpose, Basic Operations	7 minutes

Matrices - Linear equations and matrices

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts with worked examples and practice questions	Representing linear systems with matrices	
Libre Text	Website	Concepts, examples and methods	Solving systems of equations with matrices	
The Lazy Engineer	Video	Concepts	Algebraic system of equations with matrices	7 min

Matrices – Determinants

Resource	Type	Content	Description	Length
Determinants | HELM Workbook	PDF Notes	Concepts, worked examples, and exercises	Determinant calculation for 2x2 and 3x3 using Laplace Expansion	8 pages
Determinants | Tom Rocks Maths	Video	Concepts and worked examples	Theory, properties, and calculations	27 minutes

Matrices – System of Linear Equations

Resource	Type	Content	Description	Length
LibreTexts	Website	Concept, worked examples, and simpler exercises	Augmented matrix, Basic Operations, Gaussian elimination	
HELM	PDF Notes	Concepts, worked examples, and exercises	Gaussian elimination and partial pivoting concept	9 pages
Professor Dave Explains	Video	Concepts, worked examples, and exercises	Gaussian elimination and reduced row echelon form	11 minutes

Matrices – Inverse Matrices

Resource	Type	Content	Description	Length
Analytic Solution for Inverse Matrices | Geeks For Geeks	Website	Concepts and worked examples	Minor, cofactor, determinant, adjoint definition and their use in solving for inverse matrices	
Analytic Solution for Inverse Matrices | Professor Dave Explains	Video	Concepts, worked examples, and exercises	Calculation of inverse matrix and applications	12 minutes
Analytic Solution for Inverse Matrices | Math Centre	PDF Notes	Concepts, worked example, and exercise	Calculation of inverse matrix using adjoint and determinant	2 pages

Matrices – Matrix Transformations

Resource	Type	Content	Description	Length
Linear Transformations 2D | Isaac Physics	Website	Concepts, worked examples, and exercises	All 2D transformations of matrices	
Matrix Transformations | Interactive Linear Algebra	Website	Concepts and worked examples	Matrix transformations	
Linear Transformations 3D | Isaac Physics	Website	Concepts and worked examples	3D transformations	
2D and 3D Transformations | University of Cambridge	PDF Notes	Concepts and worked examples	2D & 3D Transformations + Invariant lines/points	
Matrix Transformations in 2D | 1st Class Maths	Video	Concepts and worked examples	2D transformations	14 minutes

Matrices – Eigenvalues and Eigenvectors

Resource	Type	Content	Description	Length
Eigenvalues, Eigenvectors and Applications | HELM Workbook	PDF Notes	Concepts, worked examples, and exercises	Basics of Eigenvalues and Eigenvectors, with applications including Diagonalisation and Systems of ODEs	Pg 1-45 (45 Pages)
Eigenvalues and Eigenvectors | Mathsisfun	Website	Concepts and worked examples	Understanding of Eigenvalues and Eigenvectors	
Eigenvalues and Eigenvectors | LibreTexts	Website	Concepts and worked examples	Definitions and finding Eigenvalues and Eigenvectors	
Eigenvalues and Eigenvectors (Visualisation) | 3Blue1Brown	Video	Concepts and visualisations	Visualisation of Eigenvalues and Eigenvectors, Introduction to Eigenspaces	17 minutes
Finding Eigenvalues and Eigenvectors | Professor Dave Explains	Video	Concepts and worked examples	Basics of Eigenvalues and Eigenvectors	9 minutes

Power Series - Maclaurin/Taylor Series

Resource	Type	Content	Description	Length
Maclaurin Series | Houston Math Prep	Video	Concept and worked examples	Motivation and finding Maclaurin Series	22 minutes
Maclaurin and Taylor Series | HELM Workbook	PDF Notes	Concepts, worked examples, exercises	Derivation, Worked Examples and Exercises for Maclaurin Series	12 pages
Maclaurin and Taylor Series Derivation | LibreTexts	Website	Concepts and worked examples, exercises	Derivation, Worked Examples for Maclaurin & Taylor Series and extensions	
Maclaurin Series | StoryofMathematics	Website	Concepts and worked examples, exercises	Derivation, Worked Examples and Exercises for Maclaurin Series	

Differentiation 1 – Rules

Resource	Type	Content	Description	Length
Properties of Derivatives | MySecretMathTutor	Video	Concepts and worked examples	Introductory properties of derivatives	10 minutes
Derivative Rules | The Organic Chemistry Tutor	Video	Concepts (formulas) and worked examples	Introductory derivative rules	20 minutes
Derivative Rules | MathReview101	Video	Concepts (formula) and worked examples	Power rule, product rule, chain rule, and quotient rule	10 minutes
Derivative Rules | BlackPenRedPen	Video	Worked examples	Chain rule, product rule, and quotient rule	11 minutes
Derivative Rules (Except Chain Rule) | SFU	Website	Concepts, worked examples, and exercises	Introductory derivative rules, product and quotient rule	
Chain Rule | SFU	Website	Concepts and exercises	Chain rule	

Differentiation 2 – Limits

Resource	Type	Content	Description	Length
Introduction to Limits | The Organic Chemistry Tutor	Video	Concepts and worked examples	Introductory understanding of limits and how to identify limits on graphs	20 minutes
Visualizing Limits | Khan Academy	Website	Concepts and worked examples	Rough visual understanding of limits	
Introduction to Limits | LibreTexts	Website	Concepts and worked examples	Understanding of limits, when they do not exist, and application to calculus	

Differentiation 2 – Implicit Differentiation

Resource	Type	Content	Description	Length
Implicit Differentiation | Math Centre	PDF Notes	Concepts, worked examples, and exercises	Revises chain rule and demonstrates how its applicable for implicit differentiation	6 pages
Implicit Differentiation | Lamar	Website	Concepts and worked examples	Uses examples to explain implicit differentiation	
Example of Implicit Differentiation | Eddie Woo	Video	Concepts and worked examples	Uses an example to explain implicit differentiation	11 minutes
Implicit Differentiation | Professor Dave Explains	Video	Concepts, worked examples, and exercises	Implicit differentiation with trig and product rule	12 minutes
Concept of Implicit Differentiation | 3Blue1Brown	Video	Concept	Conceptual understanding of implicit differentiation	15 minutes

Differentiation 2 – Optimization

Resource	Type	Content	Description	Length
Optimization with Derivatives | Lamar		Concepts and worked examples	Optimization using first and second order derivatives	
Optimization with Derivatives | LibreTexts	Website	Concepts, worked examples, and exercises	Optimization calculations and applications of optimization	
Optimization with Derivatives | The Organic Chemistry Tutor	Video	Concepts and worked examples	Uses examples to explain optimization concepts. Would recommend only doing a couple examples	1 hour and 4 minutes
Optimization with Derivatives | Professor Dave Explains	Video	Concepts, worked examples, and exercises	Optimization concept and second derivative test	11 minutes

Differentiation 2 – Sketching

Resource	Type	Content	Description	Length
Curve Sketching | SFU	Website	Concepts, worked examples, and exercises	Curve sketching steps	
Curve Sketching | LibreTexts	Website	Concepts and worked examples	Curve sketching steps	
Curve Sketching | The Organic Chemistry Tutor	Video	Concepts and worked examples	Graphing functions with first and second derivatives, and asymptotes	41 minutes
Curve Sketching | Cole's World of Mathematics	Video	Concepts and worked examples	Explains process of graphing a function (steps)	15 minutes

Differentiation 2 – Parametric Functions

Resource	Type	Content	Description	Length
Derivative of Parametric Functions | Math Centre	PDF Notes	Concepts, worked examples, and exercises	Differentiating parametric functions, proof of formula	
Derivative of Parametric Functions | LibreTexts	Website	Concepts and worked examples	Proof of formula for derivative of parametric functions, examples, and some applications	
Derivative of Parametric Functions | The Organic Chemistry Tutor	Video	Concepts and worked examples	Introductory formula and lots of examples	11 minutes
First and Second Order Derivative of Parametric Functions | BlackPenRedPen	Video	Concept (formula) and a worked examples	First and second order derivative of parametric functions	3 minutes

Integration 2 – Riemann Sum

Resource	Type	Content	Description	Length
Riemann Sums | LibreTexts	Website	Concept and worked examples	Conceptual understanding of how Riemann sums work and how they relate to integrals	
Riemann Sums | Math with Dr. Claire	Video	Concept	Concept of Riemann sums	8 minutes
Riemann Sums | The Organic Chemistry Tutor	Video	Concept and worked examples	Concept of Riemann sums	20 minutes

Integration 1 – Elementary Integrals

Resource	Type	Content	Description	Length
Whitman	PDF Notes	Concepts, worked examples, and exercises	All integration topics	26 pages
MathIsFun	Website	Concepts and worked examples	Introductory integral rules and properties	
LibreTexts	Website	Concepts and worked examples	Derivatives and integrals of hyperbolic functions, calculus of inverse hyperbolic functions	
The Organic Chemistry Tutor	Video	Concept and worked examples	Introductory integration rules	14 minutes
The Organic Chemistry Tutor	Video	Concepts and worked examples	Integrals of hyperbolic functions	8 minutes

Integration 2 – Integration Techniques

Resource	Type	Content	Description	Length
Integration by Substitution | LibreTexts	Website	Concepts and worked examples	Completing the square, definite integrals, changing bounds	
Integration by Parts | LibreTexts	Website	Concepts and worked examples	Integration by parts and with substitution	
Integration by Partial Fractions | LibreTexts	Website	Concept and worked examples	Integration by partial fraction decomposition	
Integration by Substitution | The Organic Chemistry Tutor	Video	Concepts and worked examples	Integration by substitution and manipulation of u-sub	21 minutes
Integration by Parts | The Organic Chemistry Tutor	Video	Concepts and worked examples	Integration by parts, by parts multiple times, setting equal	33 minutes
Integration by Partial Fractions | The Organic Chemistry Tutor	Video	Concept and worked examples	Partial fractions integration, different partial fractions	41 minutes
Determining Integration Techniques | BlackPenRedPen	Video	Worked examples	Determining which integration technique to use	23 minutes

Integration 2 – Definite Integrals and Area under the Curve

Resource	Type	Content	Description	Length
Definite Integrals and Area | The Organic Chemistry Tutor	Video	Concept and worked examples	Introductory understanding of differences between Definite Integrals and Area under the Curve	11 minutes
Definite Integrals Calculations | MathIsFun	Website	Concept and worked examples	Introductory understanding of differences between Definite Integrals and Area under the Curve, properties of definite integrals	
Definite Integrals and Area under the Curve | HELM Workbook	PDF Notes	Concept, worked examples and exercises	Evaluating definite integrals and area under the curve	Pg 14-32 (19 pages)
Area under and between Curves by Integration | ExamSolutions	Video	Worked examples	Evaluating the area under and between curves	27 minutes

Integration 2 – Trigonometric and Hyperbolic Substitution

Resource	Type	Content	Description	Length
LibreTexts	Website	Concept and worked examples	Standard trigonometric substitution by completing the square	
Math24	Website	Concept and worked examples	Standard trigonometric and hyperbolic substitutions	
The Organic Chemistry Tutor	Video	Concepts and worked examples	Introductory trigonometric substitutions	20 minutes
Professor Dave Explains	Video	Concepts, worked examples, and exercises	Integration by trigonometric substitution	16 minutes
BlackPenRedPen	Video	Worked example	Worked example of hyperbolic substitution	8 minutes
Jemason Exam Tuition	Video	Worked examples	Comparison between trigonometric and hyperbolic substitution	15 minutes

Integration 2 – Parametric Integration

Resource	Type	Content	Description	Length
Lamar	Website	Concept and worked examples	Integration of parametric functions	
StudySmarter	Website	Concept and worked examples	Integration of parametric functions	
The Organic Chemistry Tutor	Video	Concept and worked examples	Derivation and steps of determining area	11 minutes
Dr. Trefor Bazett	Video	Concept and worked example	Derivation of formula	6 minutes

Integration 2 – Volume of Revolution

Resource	Type	Content	Description	Length
SFU	Website	Concept and exercises	Volume of revolution using washer and disk method	
Lamar	Website	Concept and worked examples	Method of disks	
The Organic Chemistry Tutor	Video	Concept and worked examples	Method of disks and washers	20 minutes
Professor Dave Explains	Video	Concept, worked examples, and exercises	Explanation of formulas for disk and washers	11 minutes
BlackPenRedPen	Video	Worked examples	Lots of worked examples to practice with	28 minutes

Integration 2 – Trapezium Rule and Newton-Raphson

Resource	Type	Content	Description	Length
Numerical Integration and Error Analysis | HELM Workbook	PDF Notes	Concept, Worked Examples and Exercises	Trapezium Rule, Introductory error analysis and extensions	Pg 28-57(30 pages)
Trapezium Rule | MathsPanda	PDF Notes	Concept, Worked Examples	Trapezium Rule	5 pages
Trapzeium Rule | Maths Genie	Video	Concept, Worked Examples	Trapezium Rule	11 mins
Newton-Raphson | Sheffield	PDF Notes	Concept, Worked Examples and Exercises	Newton-Raphson Method	9 pages
Newton's Method | The Organic Chemistry Tutor	Video	Concept, Worked Examples	Newton-Raphson Method	11 mins

Integration 1 - Finding integrals

Resource	Type	Content	Description	Length
Maths is Fun	Website	Concepts and practical examples	What is integration and its notations	
CUEMATH	Website	In depth look at concepts	Rules and methods of integration	
BBC BItesize	Website	Concepts, example and questions	Integrating basic equations	
Khan Academy	Video	Concepts	Introduction to integral calculus	5 min

Integration 1 - Integrals of a constant

Resource	Type	Content	Description	Length
CUEMATH	Website	Recap of concepts, examples and practice questions	Intro and properties of the constant of integration	
The Math Sorcerer	Video	Quick recap of a method	How to find the definite integral of a constant	2 min
Brian McLogan	Video	Quick recap of a method	Evaluating the integral of a constant	1.30 min

Integration 1 - Definite vs Indefinite

Resource	Type	Content	Description	Length
Unacademy	Website	Recap of concepts	Summary of definite and indefinite integrals	
Khan Academy	Website	Concepts with explanation videos, worked examples and practice questions	Definite integral as area, properties	
Khan Academy	Website	Concepts with explanation videos, worked examples and practice questions	Definite integral evaluation	
Khan Academy	Website	Concepts with explanation videos, worked examples and practice questions	Indefinite integrals intro, indefinite integrals of common functions,	

Integration 1 - Exponential and log functions

Resource	Type	Content	Description	Length
Libre Texts	Website	Concepts, worked examples and exercises	Integrals that involve log and exponential functions	
Tyler Wallace	Video	In depth look at concepts	Natural log, chain rule, product rule, exponents, derivatives and integrals	23 min
Stonybrook	PDF document	In depth look at concepts	Rules of integrals of exponential and log functions	13 pages

Differentiation 1 - Gradients and differentiation

Resource	Type	Content	Description	Length
Save My Exams	Website	Revision style notes	The basics of differentiation	
The GCSE Maths Tutor	Video	In depth concepts	The rules and properties of differentiation	32 min

Differentiation 1 - Gradient expression

Resource	Type	Content	Description	Length
BBC Bitesize	Website	Recap with worked examples and practice questions	Recap of how to differentiate simple expressions	
Study Smarter	Website	In depth look at concepts, and worked examples	Methods for deriving equations	
Newcastle University	Website	Concepts with examples	Summary of the rules of differentiation	

Differentiation 1 - Different rules of differentiation

Resource	Type	Content	Description	Length
Physics and Maths Tutor	Website	Cheat sheets	The basics of differentiation	

Differentiation 1 - Sketching derivatives

Resource	Type	Content	Description	Length
The Organic Chemistry Tutor	Video	Concepts	Sketching derivatives from parent functions	31 min
Save My Exams	Website	Revision styles notes	Sketching gradient functions	
Seneca	Website	Concepts and worked examples	Finding derivatives	

Differentiation 1 - Minima/maxima

Resource	Type	Content	Description	Length
Math Centre	PDF document	In depth look at content and exercises	Stationary points and turning points	10 pages
Study Well	Website	Recap of concepts with explanatory video and examples	What are stationary points	

Differentiation 1 – Slope and notation

Resource	Type	Content	Description	Length
Khan Academy	Website	Concepts with explanation videos, examples and exercises	Subtopics: defining a derivative and derivative rules	
Physics and Maths Tutor	Website	Cheat sheets	Differentiation	
Revision Maths	Website	Concepts and examples	How to differentiate	
The GCSE Maths Tutor	Video	In depth concepts	Covering the basics of differentiation	30 min
alevelmaths.co.uk	Website	Concepts and examples	What and how to differentiate	
Save My Exams	Website	Revision style notes	First principles of differentiation	

Differentiation 1 – Derivatives of simple functions

Resource	Type	Content	Description	Length
Maths Info	Website	Definitions/concepts	List of derivatives of simple functions	
Web formulas	Website	Definitions/concepts and examples	List of derived functions	
Khan Academy	Website	Concepts with explanation videos, examples and exercises	Derivative definition, derivative rules and estimating derivatives	

Differentiation 1 – Chain rule

Resource	Type	Content	Description	Length
Math Centre	PDF document	Concepts, exercises and examples	Functions of functions, chain rule and trig functions	8 pages
Khan Academy	Video	Concepts	Intro to the chain rule	5 min
Khan Academy	Website	In depth concepts, practice questions and examples	Chain rule	
BBC Bitesize	Website	Definition, examples and exercises	Chain rule	
The Organic Chemistry Tutor	Video	Concepts	Chain rule for finding derivatives	
Khan Academy	Video	Concepts	Into to the chain rule	

Integration 1 – Trapezium Rule and Newton-Raphson

Resource	Type	Content	Description	Length
Revision maths	Website	Recap of concept	Trapezium rule	
Save My Exams	Website	Revision style notes	Trapezium rule	
alevelmaths.co.uk	Website	Concepts and exampless	Trapezium rule	
Metric	Website	Quick concept breakdown	Trapezium and Simpson's rules	
The Organic Chemistry Tutor	Video	Concepts	Trapezoidal rule	12 min
MME Revise	Website	Concepts with explanation videos and exercises	Newton Raphson method formula	
BYJU'S	Website	Concepts and exampless	Newton Raphson method	
The Organic Chemistry Tutor	Video	Concepts	Newton's method	10 min

Integration 1 – Elementary Integration 2

Resource	Type	Content	Description	Length
Instituto de Matemática Pura e Aplicada	Video	Concepts	Integral of simple functions	14 min
Khan Academy	Explanation videos	Concepts and worked examples	Integrals and their applications, differential calculus	
Maths is Fun	Website	Concepts and practical examples	Intro to integral calculus	
Khan Academy	Video	Concepts	Intro to integral calculus	5 min
Math Centre	PDF document	Concepts, examples and exercises	Integration by substitution	10 pages
The Organic Chemistry Tutor	Video	Concepts	How to integrate using U substitution	21 min

Solving equation – Linear equations

Resource	Type	Content	Description	Length
CUEMATH	Website	Concepts	Intro to linear equations	
Third Space Learning	Website	Concepts with explanation videos, examples and exercises	Linear equations	
The Organic Chemistry Tutor	Video	Concepts	Covering the basics of linear equations	32 min
BBC Bitesize	Website	Concepts and examples	How to solve linear equations	
Kahn Academy	Video	Concepts	Linear equations	7 min