ST. ANDREW'S COLLEGE
Cambridge

Engineering Foundation Syllabus

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St. Andrew's College, Cambridge Admissions Policy

This policy concerns admissions of students applying for University Foundation courses and should be read in conjunction with the St. Andrew's College, Cambridge prospectus and other policies. The policy applies to all students.

Characteristics of St. Andrew's College, Cambridge

St. Andrew's College, Cambridge is a co-educational independent Sixth Form College and provides both boarding and on the odd occasion, day places, for approximately 160 students per academic year. It offers two-year A-Level programmes, one-year GCSE, Pre-A level and a ten month and seven-month Foundation programme. It is a limited company owned by Mr Mervyn Martin, David Martin and Hanna Claydon and run on a day-to-day basis by Mr Mervyn Martin, Mrs Hanna Claydon and the Principal Wayne Marshall. A percentage of the profit is reinvested in the college each year to improve the educational provision of the college.

St. Andrew's College, Cambridge is "international" in nature and is characterised by exceptional levels of academic and pastoral support at all stages. The age range is 14.5-21, although the college is pleased to admit several more mature students each year according to their individual circumstances.

The main entry point is in September. However, students are also accepted in January when we offer an 18-month A-Level programme and a 7 Month Foundation course. We do have students wishing to join at other times of the year as late joiners. In such circumstances, applications will be considered by the Registrar/Principal on a case-by-case basis. Where possible, such late joiners are integrated into appropriate groups and receive supplementary tuition to facilitate the transition.

Admissions Criteria

Subject to real limits on student numbers imposed by boarding places, the availability of host families and resources, the college will admit applicants who have the potential to achieve success through the curriculum offered. Applicants must:

- Demonstrate a strong commitment to further study and to the ethos of the college
- Satisfy the requirements for admission to an agreed programme of study
- Agree to adhere to the Rules of the College

The college aims to welcome students from all backgrounds, irrespective of nationality, race, religion, gender, sexual orientation or disability. However, we are not able to cater for all kinds of disability due to the nature of the facilities and any such requirements or needs must be declared to the college from the beginning so that proper assessment can be made.

Selection Process

The selection process has three elements:

1. Application. Applications must be made in hard copy on the official college form, as provided with the prospectus or electronically via the website. In both cases the relevant supporting documentation must be provided before the application can be processed.

To comply with UK Border Agency requirements, students requiring visas must provide copies of school reports and references, transcripts and any examination certificates. The originals will have to be presented for scrutiny as part of their visa applications.

2. Interview. Interviews are conducted by a senior member of staff, usually the Registrar and on occasions the Principal. There may also be input from relevant teaching staff and other members of the senior management team. The purposes of the interview are to:

- Explain the academic, pastoral and extracurricular provision available at the college and provide advice on appropriate course choice.
- Assess the suitability of a prospective student for a place at St. Andrew's College, Cambridge and for his/her chosen courses. Entry criteria for courses are given at the end of this document.
- Provide an opportunity for a prospective student and parents / guardians / agents to look around the college.
- Provide advice about entry into Higher Education.
- Answer any questions a prospective student and parents / guardians / agents may have about the college.

Although we prefer to interview prospective students in person in Cambridge, it is not always possible for international students to attend. In such cases we will arrange to conduct Skype interviews on-line direct to the applicant, through the offices of an established agent or through any other portal that is workable and convenient for the applicant. If an interview is not possible, the college reserves the right to seek broader testimony to confirm an applicant's suitability for their intended course.

3. Testing and assessment (where required). The college undertakes testing and assessment with prospective students whose first language is not English. This is to determine their English and mathematic proficiency and to determine their ability to succeed with the academic demands of the courses they propose to take.

Disclosure. Parents or guardians / agents are required to disclose any known or suspected circumstances relating to their son/daughter from the beginning of the application process. These circumstances may relate to the following:

- The student's physical, mental or emotional health.
- The student's disability or disabilities.
- The student's learning difficulties.
- Any disciplinary issues at the student's previous school(s).

The college reserves the right to terminate the studies of a student for whom it becomes obvious that information pertaining to the above was withheld during the admissions process.

Registration and Enrolment

Offers and enrolment

On completion of the selection process, applicants will be advised of the outcome and, where appropriate, formal offers will be made. All offers will be conditional upon a satisfactory reference being obtained from a student's most recent school or college. Final enrolment will only be confirmed once all the necessary registration documentation and payments have been completed as detailed in the college's Terms and Conditions of Acceptance.

Grounds for rejection

The following list details possible grounds for not being offered a place at St. Andrew's College, Cambridge but is not exhaustive:

- Insufficient academic ability for the programme applied for.

- Exclusion from the previous school.
- Unsatisfactory reference.
- Unsatisfactory disciplinary or attendance record.
- Insufficient capacity to accommodate a student's entry point or chosen courses.
- Failure to provide the necessary supporting documentation and evidence in reasonable time.

The college will write to rejected applicants explaining the reasons for rejection, if requested.

Special circumstances

We recognise that a student's academic history can be affected by circumstances, for example: If he/she has been unwell when sitting examinations or tests or has been absent for any significant period from the previous school; If there are family circumstances such as divorce or bereavement; If the student's first language is not English; If the student has a disability or specific learning difficulties. Where appropriate, these factors will be considered, and the college may request additional information to be provided such as an Education Psychologist's report, medical certificates or samples of work to assist us in the assessment of the student's suitability.

English Requirement

Those students enrolled on Foundation courses and for who English is not a first language, will be required to achieve a minimum IELTS score of 5.0 for September and 5.5 for January. Students who cannot provide satisfactory evidence of a pass at this level or proof of English level by means of an internal test and interview will not be allowed to join St. Andrew's College, Cambridge.

Foundation Course Requirements

10-month Foundation programme

The 10-month Foundation programme is an intensive, fast-track programme and is suitable for students who have already completed one or more years of A-Level study, or who have graduated with good grades from a high school system abroad. Applicants will have to demonstrate a good level of academic ability. A pass at Grade A*-C in GCSE/IGCSE English Language, IELTS 5.0 or the internal mechanism will be required for those students whose first language is not English.

Engineering Foundation

Hours of Study per Week and Topics

Subject	Number of Hours per Week	Number of Hours per Week
	10-month course	7-month course
Physics	5.5	7.5
Chemistry	5.5	7.5
English Language	3	4
Maths	5	7
PSHE	3	4
Tutor / UCAS	1	1
Total Hours	**23**	**31**

Please see the scheme of work at the end of the document for more details on areas covered by each subject. Both 10-month and 7-month courses follow the same specification. All the above courses will have one hour of UCAS and one-hour tutor group each week.

The assessment structure for the course is as follows: January Exam

All students will take an exam in each of the core subjects (Physics, Chemistry and Maths) in January of each course. This exam is to gather an understanding of the performance to date. On completion of the results transcript the student will be spoken to by his/her tutor and an Individual Learning Plan (ILP) will put together if applicable. The first exam is to monitor performance in the first term it will not be used for the overall results of the course.

Practical

Students will carry out 6 practical assessments during the spring term. The collated results of these tests will give them an overall result, which will count for 40% of the overall mark.

Final Exam

The final assessment of the course will take place in the penultimate week. Each of the core subjects (Physics, Chemistry and Maths) will be examined twice (2 hours per paper). The final exams will carry 60% of the total grade.

Subject Weighting

Each of the core subjects (Physics, Chemistry and Maths) will carry a 33.33% weighting.

Support subjects

The foundation course will be supported by the following non-examined subjects:

English
PSHE Personal Social and Health Education
English for Academic Purposes (EAP)
General Studies
Study Skills

The above-named subjects are put in place to build on and support academic performance whilst on the course.

Awards

- Pass: 50 to 59%
- Merit: 60 to 69%
- Distinction: 70 to 79%
- Distinction with Honours: 80% and above

- Attendance: Students must have a 95% or above attendance rate in all subjects to receive an award.

- Completion of work: Students must complete all work on time.

Student Support and Guidance

Each student is given guidance in tutor groups and then individually for their university application through UCAS and assistance at the end of the year with university placements.

Each student has a personal tutor throughout the academic year to provide not only academic support, but also pastoral care.

Extra lessons are arranged when necessary to support the progress of students. The students can use three student common rooms and a computer lab area to facilitate study groups and a community atmosphere.

Students are provided with a social programme consisting of various opportunities to improve their social skills and to broaden their horizons through sport, the arts, travel and friendly competition.
Students are encouraged to attend special talks and lectures in various places throughout the UK during the academic year.

Teaching Staff

The teaching staff on the Foundation programmes are all highly qualified and experienced teachers who strive to empower their students with the confidence and skills needed to achieve their best and to prepare for university and their future careers. The teachers set high standards and reinforce them whilst assisting the students in their own individual needs and learning styles.

National Council for Further Education (NCFE) Accreditation

Our course has been accredited by NCFE, an awarding organisation recognised by the qualification regulators for England and Wales. NCFE's regulators are the Office of Qualifications and Examinations Regulation (Ofqual) in England, and the Welsh Government in Wales. This course is not regulated by Ofqual but has been accredited by NCFE under our IIQ Licence.

Certification

St. Andrew's College, Cambridge provides the students with a certificate of completion of the course and a full transcript of the course with explanations to the calculations on the reverse of the transcript. Students will also receive a certificate and a transcript from the awarding body NCFE.

Summary of Syllabus Content for Each Subject:

CHEMISTRY – Specification Summary

Term 1	Term 2	Term 3
Introduction Atomic Structure / Amount of Substance Bonding / Periodicity Redox Reactions / Group 7, the Halogens Redox Reactions / Group 2, the Alkaline Earth Metals / Metal Extraction Coursework reports	Redox Reactions / Group 2, the Alkaline Earth Metals / Metal Extraction Energetics / Kinetics / Equilibria Collision Theory, Maxwell-Boltzmann Distribution, Le Chatelier's Principle, etc. Introduction to Organic Chemistry / Alkanes Coursework reports	The Haloalkanes, Alkanes / Alcohols / Analytical Techniques Presentations

Specification detail

PART A

Physical Chemistry

- Atomic structure
- Understand the importance of fundamental particles in the structure of the atom
- Mass number and isotopes
- Know the electron configurations of atoms and ions

Amount of substance

- Be able to define relative atomic mass and relative molecular mass
- Understand the concept of a mole and Avogadro's constant
- Be able to recall the ideal gas equation
- Understand the concept and relationship between empirical and molecular formulae
- Balanced equations and associated calculations

Bonding

- Nature of ionic, covalent, metallic and dative bonds
- Learn about bond polarity
- What are the forces acting between molecules?
- Recognise the different states of matter
- Shapes of molecules and ions

Energetics

- Learn about and calculate enthalpy change (calorimetry)
- Be able to apply Hess's Law
- Understand bond enthalpies and calculations

Kinetics

- Understand collision theory
- Qualitatively understand the Maxwell-Boltzmann distribution
- Effect of temperature, concentration and particle size on reaction rate
- Understand how catalysts work

Equilibria

- Understand the dynamic nature of equilibria including effects of changes in pressure, temperature and concentration on a system in equilibrium (Le Chatelier's principle)
- Importance of equilibria in industrial processes

Analytical techniques

- Understand the basic principles of mass spectrometry and infra-red spectroscopy

PART B
Inorganic Chemistry

Periodicity

- Be able to classify elements in *s*, *p* and *d* blocks
- Properties of Period 3 elements as an example of periodic trends
- Understand redox reactions, oxidation states and redox equations
- Group 2 (alkaline earth metals)
  - trends in physical and chemical properties
  - flame tests
- Group 7 (halogens)
  - trends in physical properties, and oxidizing and reducing abilities
  - identification of halide ions using $AgNO_3$
  - uses of chlorine and chlorate (I)

Extraction of metals

- Principles of metal extraction and environmental aspects

PART C
Organic Chemistry

- Nomenclature
- Structural isomerism
- Alkanes
  - structure and properties
  - fractional distillation of crude oils
  - modification by cracking
  - combustion
- Alkenes
  - structure, bonding and reactivity
  - addition reactions
  - polymerization
- Haloalkanes
  - Synthesis
  - nucleophilic substitution
  - substitution reactions
- Alcohols
  - nomenclature
  - ethanol production
  - classification of reactions
  - elimination
- Organic mechanisms

PHYSICS – Specification Summary

Term 1	Term 2	Term 3
Safety Rules, Units, Indices, Graphs and Investigations Formulas and units Scalars and Vectors Equations of Motion and Travel Graphs Projectiles and Objects Falling Freely Newton's Laws and Momentum Balanced Forces and Work, Energy, etc. Waves Coursework reports	Current Electricity and DC Currents Atomic Structure, Isotopes, and Uses of Isotopes Waves and Diffraction Electricity and Capacitance Magnetic Fields, Electromagnetism, Motor Effect, Fields due to Current and Generator Effect Density, Pressure in Fluids, Molecular Structure, Specific Heat Capacity and Stretching Materials Photoelectric Effect, Wave / Particle Duality and Spectra Nuclear Equations and Radioactivity Coursework reports	Electric Fields and Gravitational Fields Thermodynamics Presentation

PART A

Radiation

- Understand the nature of Alpha, Beta and Gamma radiation
- Be able to complete balanced equations for radioactive decay
- Understand and be able to explain the inverse square law, decay constant and half life
- Complete calculations involving decay constant, half-lives and the inverse square law

Photoelectric Effect

- Understand the concepts of the photoelectron work function energy levels and de Broglie wavelength
- Calculate kinetic energy, work function, energy level of de Broglie wavelength

Electrons, energy levels and photons

- Understand the nature of an electric field and charge
- Be able to interpret and calculate energy changes from energy level diagrams
- The nature of the wave-particle duality
- Complete calculations involving de Broglie theory

Electricity

- Understand and be able to define charge, current, Pd, resistance and power
- Be able to do calculations involving E, P, I, V, Q and t.
- Understand and apply in calculations involving Ohm's Law
- Recognise the V/I characteristics of common electrical components
- Calculate resistivity from given data

- Calculate V_T, RT and T_T for series and parallel circuits
- Be able to apply Kirchoff's Laws
- Be able to do calculations involving EMF and r
- Calculate R.M.S values for A.C.
- Interpret C.R.O. readings

PART B

Mechanics

- Understand momentum, elastic and inelastic collisions, conservation of momentum and explosions
- Calculate momentum and force from given data

Gravity fields

- Know what is meant by gravity field, field strength and mass point
- Calculate force, mass and distance for gravitation attraction
- Understand how Newton's Laws of Gravitation are applied to Geostationary and Polar satellites

Electric fields

- Understand electric field, Coulomb's law, permittivity of free space, attraction and repulsion
- Complete calculations involving Coulomb's Law
- Be able to calculate electric field strength from force and charge
- Calculate electric potential from given data
- Know similarities and differences between gravity and electric fields

PART C

Capacitors

- Recall the definitions of charge capacitance and the time constant
- Calculate capacitance from charge and voltage
- Understand how to calculate energy both graphically and from a formula

Magnetic fields

- Understand and be able to define flux, flux density and flux linkage
- Be able to use Fleming's left and right-hand rules
- Understand Faraday's and Lenz's Laws
- Use the equations $F = BIl$, $F=BQv$ and $E = IV\Delta\Phi / \Delta t$
- Explain how a transformer works
- Calculate voltage and current given the N numbers

Mathematics:

This mathematics programme has been reviewed to reflect and cater for the actual mathematical requirements of students as they progress towards their university courses. It's designed to lay the foundation for developing and consolidating effective reasoning and critical thinking while building a solid mathematical base essential for most engineering and further maths studies. The programme aim is to provide students with a valuable range of tools for analysing, modelling, formulating and solving general mathematical problems including those arising from different fields of science and engineering.

Mathematics – Specification Summary

Term 1	Term 2	Term3
○ Elementary Algebra, Polynomials and Algebraic Fractions ○ Coordinate Geometry ○ Functions and their graphs ○ Differential Calculus ○ Sequences and Series ○ Integration ○ Binomial Series ○ Applications of differentiation ○ Trigonometry	○ Exponential functions, Logarithm functions and logarithm laws ○ Composite functions ○ Inverse function ○ Further Trigonometry ○ Further Differentiation ○ Further Integration ○ Numerical methods ○ Vectors ○ Matrix Algebra	○ Complex numbers ○ Kinematics general concepts: displacement, position vector, velocity and acceleration in vector form ○ Kinematics of a particle moving in a straight line ○ Motion of a particle under gravity ○ Dynamics of a particle

NB: To keep the same standard for assessment purpose, effort should be made to cover the material for each term in the term indicated. However, within each term the content may be covered in any suitable order and some components may be exceptionally moved from one term to another to respond to the students' level of attainment or if required for use by other subjects.

Assessment

This course is assessed by examination (60%) and a portfolio (40%). The portfolio is made of two components:

I. a coursework consisting of a researched essay exploring the use of mathematics (10%)
II. a project consisting of investigating, analysing, modelling and solving a real problem using both mathematical and computing tools (30%)

Pre-requisite

A medium or higher level in mathematics is suitable, equivalent to or above GCSE standard.

Specification content

1. Elementary Algebra, Polynomials and Algebraic Fractions

<u>What students need to learn:</u>

- Types of number: Natural, integer, decimal, rational, irrational and real numbers
- Common sets of numbers $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{D}$, $\mathbb{Q}$ and $\mathbb{R}$, together with the correct use of related set notations such as $\{\ \}$, $\in$, $\cup$, $\cap$ …etc.
- Working with forms of number such as reciprocals, indices (or powers), fractions and surds. Students should learn properties of fractions, indices and surds including how to rationalise the denominator

- Algebraic expressions and related operations including: determining the degree and coefficients of a polynomial, addition, subtraction, multiplication, simplification, expansion, factorisation and completing the square for trinomials
- Algebraic fractions and related operations including decomposition into proper and improper fractions, simplification, long division by a linear term, the remainder theorem, the factor theorem and decomposition into partial fractions.
- Equations: distinction between, expressions, equations, identities and functions. Solving quadratic and simple cubic equations using factorisation, completing the square or the discriminant method for quadratic equations. Solving simultaneous linear equations using elimination, substitution or Cramer method where applicable. Solving simultaneous mixed equations (linear and non-linear)
- Inequalities: solving linear, quadratic and simultaneous inequalities. For quadratic inequalities, the use of the curve is required along the sign inspection methods

2. Coordinate Geometry

What students need to learn:

- Recognising common 2D shapes and recalling their basic properties with focus on quadrilateral shapes including Trapeziums, Parallelograms, Rectangles, Squares, Rhombuses, Kites and triangular shapes including Isosceles, Right-angled and Equilateral triangles
- Determining and using the Cartesian equation of a straight line in a system of axes (Ox, Oy) in different forms such as Y= mX+c, aX+bY+c = 0 or Y – YI = m(X-XI)
- Parallel and perpendicular straight lines
- Intersection of 2 or more straight lines
- Coordinates of the midpoint of a segment AB
- Distance between two points A and B
- Geometric properties of a circle in a plane
- Cartesian equation of a circle
- Intersection of a circle and a straight line or of 2 or more circles
- Solving general problems involving circles, lines and other shapes

3. Functions and their graphs

What students need to learn:

- Precise definition of a function and the related concepts of domain and range. One-to-one functions, piecewise functions, modulus functions, radical functions and rational functions
- Basic combinations of 2 or more functions using addition, subtraction, multiplication and division
- Sketching graphs of simple functions including linear, quadratic, cubic, homographic ($y = \frac{aX+b}{cX+d}$) and Piecewise functions. The concepts of limits and continuity are not in the scope of this part, but the vertical or horizontal asymptotes and infinite branches must be determined and used where required
- Transformation of curves: $y = f(x + a)$, $y= f(x) + a$, $y = f(ax)$ and $y= af(x)$, $y=-f(x)$, $y =f(-x)$, $y = |f(x)|$ and $y = f(|x|)$. Students should be able to correctly describe each transformation and apply it to sketch the corresponding curve based on the curve $y=f(x)$

4. Differential calculus

What students need to learn:

- Differentiation from Ist principle
- Basic rules of differentiation for polynomials and algebraic functions with rational Indices
- Second and higher derivatives
- Equation of the tangent or the normal at a given point
- General problems involving differentiation and coordinate geometry

5. Sequences and Series

What students need to learn:

- General concepts of a sequence and series: 1st term, general term, recurrence relation, sum of first n terms, the use of Sigma notation
- Arithmetic sequence and series
- Geometric sequences and series including sum to infinity where defined
- General problems involving sequences and series

6. Integration

What students need to learn:

- Indefinite integration as the reverse process of differentiation
- Basic rules of integration for polynomials and algebraic functions with rational Indices
- Finding the constant of integration given the initial conditions
- Definite integral
- Area under a curve, area between a curve and a straight line
- Volume of a solid of revolution

7. Binomial Series

What students need to learn:

- Expansion of $(a + b)^n$ *where n is a positive integer*
- Pascal's Triangle, Combinatorial numbers: n! and nCr
- Using nCr to find the coefficients in the binomial expansion
- expanding $(1 + x)^n$ *where n is a positive integer*
- Use of the binomial series to find approximations such as in $(2.02)^9$

8. Applications of differentiation

What students need to learn:

- Use of differentiation to determine the set of values for which a differentiable function is increasing or decreasing
- Use of differentiation to find stationary points and determine their nature
- Use differentiation to solve simple optimisation problems

9. Trigonometry

What students need to learn:

- Determining and working with the 3 trigonometric ratios sine, cosine and tangent
- Trigonometric identities
- Properties involving complementary angles and supplementary angles
- Sign of trigonometric functions using the "CAST" rule
- Trigonometric ratios of special angles
- Reciprocals of the trigonometric ratios
- Converting between degrees and radians
- Sine rule and cosine rule
- Area of a triangle using 2 of its sides and the angle between them
- Curves of trigonometric functions: $y = \sin x$, $y = \cos x$ and $y = \tan x$
- Basic trigonometric equations: $\sin x = a$, $\cos x = b$, $\tan x = c$ and equations that can be expressed as a combination of these basic equations, including simple quadratic trigonometric equations
- Length of an arc and area of sector or a segment of a circle
- General problem involving trigonometry

10. Exponential functions, Logarithm functions and logarithm laws

What students need to learn:

- The function a^x and its graph and properties
- Graph of logarithm function with base a
- Logarithm laws including the formula for changing the base
- Solving logarithm and exponential equations and simple inequalities

11. Composite functions and Inverse function

What students need to learn:

- Composite function of 2 or more functions where it's defined
- Domain and range of the composite function
- Properties of composite functions such as the associativity: fo(goh) = (fog)oh
- Expressing a given function as a composite of 2 or more functions
- Solving equations involving the composite function such as gf(x) = c where c is a given value
- Finding the inverse function of a one-to-one function
- Domain and range of the inverse function
- Properties of the inverse function
- Curve of the inverse function
- Inverse of common functions such as linear, quadratic, cubic, exponential, logarithm and trigonometric functions. The domain and range will have to be restricted as required to ensure the initial function is one-to-one

12. Further Trigonometry

What students need to learn:

- Compound angle formulae
- Double angle formulae
- Proof of trigonometric identities
- Application to finding the exact values of trigonometric ratios for angles that can be derived from special angles
- Solving more trigonometric equations (not to include AcosX +BsinX = C)

13. Further differentiation

What students need to learn:

- Differentiating the exponential function $f(x) = e^x$
- Differentiating logarithm functions $f(x) = \ln(x)$ and $f(x) = log_a(x)$
- Differentiating trigonometric functions
- The chain rule
- The product rule
- The quotient rule
- Differentiating $f(x) = a^x$

14. Further integration

What students need to learn:

- Integration using standard forms such as $nf^{n-1}f'$ and $\frac{f'}{f}$
- Integration using partial fractions
- Integration by substitution
- Integration by parts
- Application of integration to finding area between two curves and volume of revolution

15. Numerical methods

What students need to learn:

- Investigating the conditions for the equation $f(x) = 0$ *to have a solution in a given interval* [a,b]
- Interval bisection method
- Linear interpolation
- Newton-Raphson method
- Problems of accuracy
- Finding an approximation to $\int_a^b f(x)dx$ using the trapezium rule
- Percentage error when using the trapezium rule
- Over-estimate and under-estimate when using the trapezium rule

16. Vectors

What students need to learn:

- Definition and properties of a vector as mathematical object with a magnitude and a direction
- Elementary vector algebra: addition, subtracting and multiplication by a scalar
- Parallel vectors
- Using vectors to represent the position of a point in a 2 dimensional or 3-dimensional space
- Component form of a vector
- Operations with vectors using a basis $(\vec{i}, \vec{j}, \vec{k})$
- The scalar product
- Vector equation of straight line in a 3D space
- Parametric equation of a straight line
- Relative positions of 2 straight lines in a 3D space

17. Matrix algebra

What students need to learn:

- nxm matrices
- Addition and subtractions of matrices with the same dimensions
- Multiplication of a matrix by a scalar
- Product of 2 matrices with compatible dimensions
- Determinant of a matrix
- Transpose of a matrix
- Singular matrices
- Inverse of a non-singular 2x2 matrix
- Solving systems of linear equations using matrix representation

18. Complex numbers

What students need to learn:

- Complex numbers in algebraic form: the real part, the imaginary part, the modulus and the conjugate of a complex number
- Operations with complex numbers in algebraic form: addition, subtraction, multiplication by a scalar (real number), product of 2 complex numbers and division
- Trigonometric form of a complex number
- Properties of the modulus and the argument of a complex number
- Introduction to DeMoivre's theorem
- Representation of a complex number in Argand diagram
- Complex roots of polynomial equations

19. Kinematics general concepts

What students need to learn:

- Modelling objects as particles: commonly used assumptions
- Describing the motion of particle
- Position vector and displacement vector
- Velocity as a vector
- Acceleration as a vector

20. Kinematics of a particle moving in a straight line

What students need to learn:

- Equations to describe the motion of a particle in a straight line
- Particle moving with constant speed
- Particle moving with uniform acceleration (or deceleration)
- Distance-time, Speed-time and acceleration-time graphs
- Motion of a particle in a vertical line under gravity

21. Dynamics of a particle

What students need to learn:

- Representation and characteristics of a force
- Newton's 1^{st} law and 2^{nd} law
- Friction forces
- Motion along a line of the greatest slope on an inclined plane
- Connected particles
- Momentum of a particle
- Impulse of a force
- Momentum-Impulse principle
- Conservation of momentum
- Application to the collision of 2 particles
- The moment of a force about a given point
- Using moments to solve equilibrium problems

Information and Communication Technology (ICT):

Is an integral part of the Foundation course and all aspects of this area are included in the core subjects and the study skills components? Although individual lesson time is not given to this subject, the student must be able to demonstrate their appreciation of and ability to integrate ICT within the demands of the course.

English:

English is approached on an individual basis, with each student being tested with in-house IELTS exams or based on previous achievements such as a C or above grade in GCSE or IGCSE English or a proven IELTS grade.

The IELTS classes are established by level and designed to meet the needs of the student at that level to enable progress at a satisfactory pace onto the next level in preparation for the IELTS exam.

Students who obtain a 6.5 in IELTS during their stay at the college or arrive with a 6.5 in IELTS or above will not be required to attend IELTS classes in college. If a student has gained 6.5 in IELTS but needs extra support for university this will be planned and reviewed by the IELTS coordinator on an individual student basis.

University Preparation Course (UPC):

Study Skills/General Studies/ Personal, Social, Health and Economic Education

There is a standalone specification, which explains the course in full.

UCAS:

The UCAS process is given very careful consideration with a lot of time and effort being put aside by the tutors to ensure all the students apply to the correct universities given their ability, potential and preferences.

Document review:

Issue No: 04	Document Number: STAN: BF/2015/WM/RB
Issue Date: 1st September 2011	Originator: Wayne Marshall
Version: 12	Responsibility: College Principal
Reason for version change: Review & Update by David Applin (Head of Science)	Dated: 1st September 2011
Authorised by: Wayne Marshall Date: 12th July 2018	Signature: Wayne Marshall

Recent reviews: July and August 2015, July 2016, August 2017, 2018, 2019. Next Review: August 2020.