ST. ANDREW'S COLLEGE
Cambridge

COMPUTER SCIENCE/AI FOUNDATION SPECIFICATIONS

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ABOUT ST ANDREW'S COLLEGE CAMBRIDGE

St. Andrew's College, Cambridge is a co-educational independent Sixth Form College providing boarding and day places for up to 157 students each academic year.

St Andrew's College is a member of the Dukes Education family. Dukes is a family of schools, teachers, learners, and parents connected by our pursuit of an extraordinary life for every member of our community.

Our philosophy is to support everyone to live with purpose, to encourage a love of learning, and to act as a team. All of this is underpinned by a quality standard that runs through everything we do.

St. Andrew's College, Cambridge is "international" in nature and is characterised by exceptional levels of academic and pastoral support at all stages. We accept students aged 15-22 years old.

We believe that education is a journey to be enjoyed and shared at every stage of life, unlocking extraordinary possibilities for every student.
St Andrew's College offers the following courses.

- Pre A-Level (September and January start)
- 2-year A-Level (September start)
- 3-year A-Level (September start)
- 2.5 -year A- Level (January start)
- 1-year University Foundation course (September start)
- 2-year university foundation courses (September start)
- 18-month university foundation course (January start)

Many of our applicants will commence courses in September, although we have up to 20 students each year who join the January intake. There are cases where students request to join the course as late joiners. These applications are reviewed on a case-by-case basis by the Principal and the Curriculum Manager. Where possible, late joiners are integrated into appropriate groups and receive additional tuition to make up for any time missed.

ADMISSIONS CRITERIA

Subject to real limits on student numbers imposed by boarding places, the availability of homestay hosts and resources, the college will admit applicants who have the potential to be successful on the course they've applied for.

Applicants must:

- Demonstrate a strong commitment to their studies
- Meet the entry requirements for the course applied for – Entrance exams & interview
- Agree to adhere to the college code of practice

The college aims to welcome students from all backgrounds, irrespective of nationality, race, religion, gender, sexual orientation, or disability.

SELECTION PROCESS AT A GLANCE

Our applicants go through a strict selection process based on three elements:

1. Application: in liaison with UKVI regulations (qualifications, Visa and language requirements)

2. Interview. Interviews are conducted by the Admissions Department with the purpose of:

- Explaining the academic, pastoral, and extracurricular provision available at the college and provide advice on courses appropriate to the student's age and academic ability
- Assess the suitability of the student for the course they have applied for (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 about the college.

3. Testing and assessment. The college will request that prospective students take entry tests in Maths and English in order to determine if their proposed course for them.

REGISTRATION & ENROLMENT

OFFERS AND ENROLMENT

We will review a student's application once the stages above have been completed. If a student's application is successful a conditional or unconditional offer will be made.

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 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

ONE-YEAR FOUNDATION PROGRAMME

The one-year 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 5.5 or a result of 5.5 or above on our internal English test is required for students whose first language is not English.

The Foundation program is accredited by the NCFE

SCIENCE FOUNDATION

SUBJECTS AND HOURS OF STUDY PER WEEK

Computer Science – Physics – Maths

SUBJECT	NUMBER OF HOURS PER WEEK
	One-year course (34)
Subject 1	6
Subject 2	6
Subject 3	6
Tutor / UCAS	3
Total Hours	**21**
Hours over the duration of the course.	**714**

THE ASSESSMENT STRUCTURE FOR THE COURSE

DECEMBER EXAM

All students will take an exam in each of the core subjects (Chemistry, Biology / Human Biology and Maths) in December 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 (Computer Science, Physics and Maths) will be examined twice (2 hours per paper). The final exams will carry 60% of the total grade.

ATTENDANCE

Students must have an attendance rate 95% or above in all subjects to pass the course.

COMPLETION OF WORK

Students must complete all work on time.

NCFE ACCREDITATION & CERTIFICATION

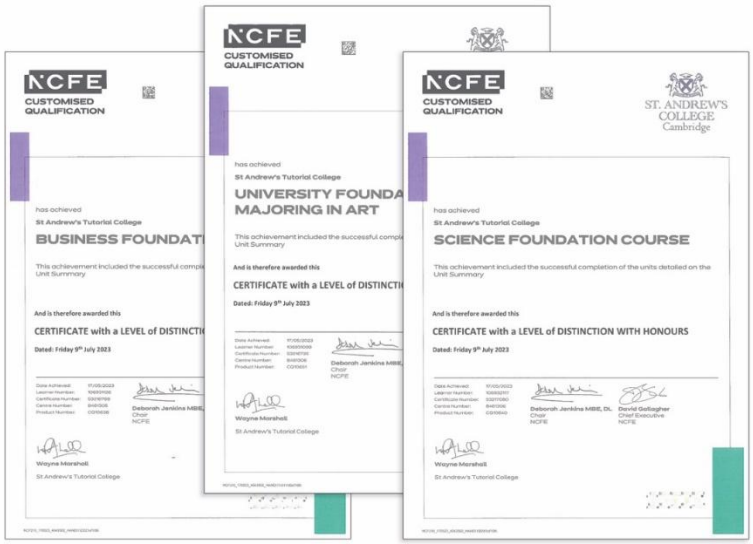
Our course has been accredited by NCFE, an awarding organisation recognised by the qualification regulators for England and Wales. NCFE's regulators are the Office of Qualifications and Examinations Regulation (Ofqual) in England, and the Welsh Government in Wales. This course isn't regulated by Ofqual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

St. Andrew's College provides the students with a Level 3 Diploma, and they will also receive a certificate and a transcript from the awarding body NCFE. (SEE SAMPLE BELOW)

Awards of Pass, Merit, Distinction and Distinction with Honours are only awarded when students meet the following criteria:

ACHIEVEMENT

Fail / Resubmit	**0-49%**
Pass	**50-59%**
Merit	**60-69%**
Distinction	**70-79%**
Distinction with Honours	**80% and above**



SUMMARY OF SYLLABUS CONTENT FOR EACH SUBJECT:

COMPUTER SCIENCE – SPECIFICATION SUMMARY

Term 1	Term 2	Term 3
Module 1-4	**Module 5-8**	**Module 8-11**

SPECIFICATION DETAIL & ASSESSMENT METHODS

Module: 1,2 Fundamentals of programming and programming techniques Common data and their use	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)
The learner can and will be able to: - Explain the importance of choosing meaningful identifiers and will complete a class task based on identifiers. - Define Common Data types and their use and complete a class task based on common data types as - integer, real/float, string, character, Boolean, date/time, pointers, arrays/ lists, records. - Explain user-defined data types and programming language built-in data types and will complete a class task based on these topics. - Explain declarations and complete a class task based on constant declaration and assignment as constant declaration and assignment, variable declaration along with assignment, selection construct, nested selection constructs. - Explain iteration and complete a class task based on iterations as iteration construct using while, iteration construct using for, iteration construct using repeat and nested iteration - critically compare the difference between definite and indefinite iterations. The learner will also complete a timed exam paper on the 3 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.*	

Module: 3 Boolean operators	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)
The learner can and will be able to: - Analyse differences between Negation, conjunction, disjunction, exclusive disjunction in Boolean operators and complete a task based on that. - explain strings relating to their manipulation and complete a class task based on strings as characteristics, string manipulation and string conversion into other types.	

- explain the meaning of random numbers relating to their practical use and complete a class task based on random numbers as random number uses and random number generation practical uses of random numbers
- explain exception handling implementation in a programming language and complete a class task based on exception handling.
- explain advantages of using various types of variables and complete a class task based on subroutines.

The learner will also complete a timed exam paper on the 5 assessment criteria for this section*.

Module: 4 Computer systems	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- explain computer systems relating to their components and complete a class task based on computer systems as data, information, hardware, software, liveware and procedures.
- explain input device types and complete a class task based on device types, their characteristics and uses. Also, the learner will complete a practical assessment to show how these aspects can be applied in the real world.
- Explain storage device types and complete a class task based on storage types, their characteristics and their uses.
- Critically compare output device types and complete a class task based on device types, characteristics and their uses.

The learner will also complete a timed exam paper on the 4 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 5 Understanding number systems	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- Explain representations relating to number systems and complete class tasks based on representation as denary representation, binary representation, octal and hexadecimal representation of numbers.
- Critically compare advantages and limitations of different representations and complete class tasks based on representations.

The learner will also complete a timed exam paper on the 2 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 6 Data representations	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- Apply operations on unsigned binary integers and complete class tasks based on unsigned binary integers along with addition and multiplication along with negative binary integers using the two's complement.
- Binary representation of fixed-point decimal numbers and complete class tasks based on this topic
- Apply prime numbers generator relating to coding and complete class tasks based on squares, cubes and prime numbers generator in a mini project style.

The learner will also complete a timed exam paper on the 3 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 7 Logic gates and logic circuits	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- Critically compare between NOT, AND, OR, XOR, NAND and NOR gates and complete an essay in times exam conditions on gates and logic circuits.
- Critically compare logic gates full adder with half adder circuit and complete class tasks based on logic gates.

The learner will complete a class-based assessment on the 2 criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 8 Computational thinking	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- Explain logical reasoning and complete class tasks based on logical thinking such as problem solving, abstraction and information hiding.
- Critically compare decomposition and composition and complete class tasks based on the use of decomposition and composition.
- Explain state machines and complete class tasks based on the uses of state machines as finite state machines, state transition diagrams and transition tables.

The learner will also complete a timed exam paper on the 3 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 9 Computer architecture	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed) **Observation

The learner can and will be able to:

- Explain the CPU and its components and complete practical assessments to show that learning has taken place regarding the CPU and its components.

- Explain registers and their function and complete practical assessments to show that learning has taken place with regard to the registers and their function.
- Critically compare Von Neuman vs Harvard architectures and complete class tasks based on the uses of Neuman and Harvard architectures.
- Explain the use of fetch-decode-execute cycle and complete class tasks based on the fetch code and factors affecting processor's speed of processing.
- Critically compare Interrupts and interrupt service routines and complete class tasks based on interrupts and interrupt.
- Apply processor instruction set and complete class tasks based on processor instruction as addressing modes and types of operation codes.
- Apply instruction set and complete class tasks based on instruction sets and coding in assembly language.

The learner will also complete a timed exam paper on the 7 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 10 Communication and networking	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed) **Observation

The learner can and will be able to:

- Explain modes of data transmission and complete class tasks-based bandwidth, bit rate and Baud rate along with serial and parallel transmission.
- Critically compare synchronous and asynchronous transmission and complete class tasks based on transmission protocols as: TCP/IP, HTTP and FTP. *
- Critically compare Network types, LAN, WAN and complete class tasks based on network types.
- Critically compare client-server network and peer-to-peer network and complete class tasks based on network types.
- Explain difference between wireless networks, protocols and network security and complete class tasks based on network types.

The learner will also complete a timed exam paper on the 5 assessment criteria for this section. This mark will then make up of a percentage of the final grade for the course.

Module: 11 Software development.	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)

The learner can and will be able to:

- Critically compare the stages of development of software as analysis stage activities and design stage activities and complete class tasks based on software development.
- Explain various stages of software development and complete class tasks based on stages of software development such as implementation stage activities, testing stage activities and evaluation.
- explain NEA specification and requirements and complete class tasks based on NEA specification.

There will be a timed exam at the end of this assessment that will cover the whole course from assessment 1 - 11.

This exam will carry 50% of the total grade and will be completed using two papers.

Physics – Specification Summary

Term 1	Term 2	Term 3
Module 1-4	**Module 5-8**	**Module 8-12**

SPECIFICATION DETAIL

Module: 1 Measurements, units, SI, converting units.	**Assessment Method:** Assignment
The learner can and will be able to: - Explain system measurements and complete class tasks based on measurements and their depending on the selection of several base units and recall the base units of the SI system. - Critically compare the difference between precision and accuracy and complete class tasks based on physical measurements as repeatability and reproducibility.	

Module: 2 Model of the atom.	**Assessment Method:** Assignment Assignment, Essay Questions *Examination (Timed)
The learner can and will be able to: - Explain the model of the atom relating to its charge and isotopes and complete class tasks based on fundamental particles their charge, specific charge, A and Z, isotopes.	

Module: 3 Understanding waves	**Assessment Method:** Assignment *Case study **Examination (Timed)
The learner can and will be able to: - Explain waves relating to a medium and vacuum and complete class tasks on terms frequency, period, amplitude, wavelength of a wave and phase. - Critically compare longitudinal and transverse waves and polarization and complete class tasks based on polarisation of transverse waves and the applications of polarisers. - Explain the principle of superposition of waves and complete a case study based on different types of waves and formation of stationary waves. There will be a timed exam at the end of assessment 3 covering all of the previous assessments which will be used	

as part of the final grade.

Module: 4 Optics relating to the behaviour of light	**Assessment Method:** Assignment *Case study *Examination (Timed)
The learner can and will be able to: - Explain the diffraction patterns produced using a single slit and will complete a case study based on diffraction and a practical assessment on double slit with monochromatic light and contrast this with the pattern produced by white light. *	

Module: 5 Electromagnetic radiation and quantum phenomena	**Assessment Method:** Assignment Essay Questions *Case study **Examination (Timed)
The learner can and will be able to: - Analyse the photoelectric effect using the photoelectric equation and complete a class-based study on photoelectric effect. - Explain energy levels and photon emission and complete in class assessment based on how line spectra implies discrete energy levels in atoms. - explain Wave-particle duality and complete a class-based study wave particle duality by identifying that electron diffraction provides evidence of particles having wave properties. There will be a timed exam at the end of assessment 3 covering all of the previous assessments which will be used as part of the final grade.	

Module: 6 Nuclear Physics	**Assessment Method:** *Case study **Examination (Timed)
The learner can and will be able to: - Explain the nature of radiation in relation to quantum phenomena. There will be a timed exam at the end of assessment Electromagnetic radiation and quantum phenomenon as Alpha, Beta and Gamma radiation in radioactivity.**	

Module: 7 Mechanics	**Assessment Method:** Essay Questions *Case study **Examination (Timed) Assignment

The learner can and will be able to:

- Critically compare between scalar and vector quantities and complete a case study looking at one key example of vectors including velocity/speed,mass,force/weight,acceleration,displacement/distance.
- Explain the moment of a force and complete a timed essay on the subject to show understanding and explanation of moments.
- Critically compare between velocity, speed and acceleration and complete class tasks based on velocity and speed.
- Explain the three laws of Newton's law and complete class tasks based on Newton's laws motion and apply them in appropriate situations.
- Resolve forces in relation to include planes and complete class tasks based on planes and solve problems including inclined planes.
- Explain the conservation of linear momentum and apply linear momentum in calculations involving collisions in one dimension.

The learner will complete a class test on Newton's Law momentum which will be part of the final assessment mark.**

- Calculate the work done on force that is not acting in the direction of displacement and complete a class task on work, energy and power.
- Explain the principle of the conservation of energy and complete a class task based on the principle of conservation of energy.

There will be a timed exam at the end of assessment 8 covering all the previous assessments which will be used as part of the final grade.**

Module: 8 Bulk properties of solids, their density and pressure.	**Assessment Method:** Assignment Examination (Timed)

The learner can and will be able to:

- Explain density in relation to Hook's law and complete a class tasks based and do calculations using the density equation in relation to Hooke’s law and explain what is meant by the elastic limit.
- Explain the Youngs modulus in relation to a spring under load and complete a practical on Spring under load and use it in calculations. This assessment will be part of the final mark.**

Module: 9 Thermal Physics	**Assessment Method:** Assignment

The learner can and will be able to:

- Explain Internal energy contained in a substance and complete a class tasks based on thermal physics and temperature along with specific heat capacity

Module: 10 Thermodynamics	**Assessment Method:** Assignment

The learner can and will be able to:

- Explain Gas laws in relation to pressure and volume and complete a class tasks based on gas laws along with a laboratory practical on Boyle's and Charles's law.

Module: 11 Current electricity	**Assessment Method:** Assignment *Examination
The learner can and will be able to: - Explain the rate of flow of charge and complete a class tasks based on rate flow. - Explain current in terms of flow of electric charges and complete a class tasks based on current including voltage graphs. - Explain resistivity relating to a wire and complete a class tasks based on resistivity and construct an experiment to determine the resistivity of a wire. - Explain circuits relating to resistors and complete a class tasks based on circuits and calculate the total resistance for combinations of series and parallel resistors. - Explain Electromotive force relating to circuits and perform calculations for circuits in which the internal resistance of the supply is not negligible. The learner will also perform practicals on Resistivity and Internal resistance which will be graded and part of the final mark of the learner.*	

Module: 12 Capacitance	**Assessment Method:** Assignment
The learner can and will be able to: - Critically compare charge capacitance and the time constant and complete a class tasks based on capacitance. - Explain the electric field relating to Coulomb's law and complete a class tasks based on electric fields, Coulomb's law, permittivity of free space, attraction and repulsion. - Explain motions relating to electric force and complete a class tasks based on electric fields, circular motion including linear and rotational speed, centripetal acceleration and force. - Critically compare flux density and flux linkage and complete a class tasks based on Faraday's and Lenz's Laws and use Fleming's left and right-hand rules. There will be a timed exam at the end of assessment 4 covering all of the previous assessments which will be used as part of the final grade.	

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 a methodical approach while building a good set of mathematical skills relevant to most science and humanities studies. The programme aims to provide students with a valuable range of tools and techniques for analysing, modelling, formulating, and solving general mathematical problems that can arise in their further studies or future practice.

MATHEMATICS – SPECIFICATION SUMMARY

Term 1	Term 2	Term 3
Module 1-3	Module 4-6	Module 7-9

SPECIFICATION DETAIL

Module: 1,2 Regression and correlation	**Assessment Method:** Assignment Observation
The learner can and will be able to: - Perform change of variables and will complete a class based study statistical hypothesis as correlation coefficients and statistical hypothesis testing for zero correlation. - Critically compare notations for conditional probability and questioning assumptions in probability and complete a class based on conditional and questioning probability. - Explain normal distribution as an approximation to the binomial distribution and complete a class based on distributions. - Apply correlation coefficients on statistical hypothesis testing for zero correlation and complete a class based study on correlation coefficients. There will be an assignment based on the assessment criteria from this learning outcome. This will count as part of the final mark of the learner.	

Module: 3 Probability	**Assessment Method:** Case study Examination (Timed)
The learner can and will be able to: - Apply conditional probability to real world problems using set notations and complete a class-based study using research from a chosen field of statistics. - Explain the questioning assumptions in probability and complete a class-based study on assumptions and	

probability.

There will be an assignment based on the 2 assessment criteria from this learning outcome. This will count as part of the final mark of the learner

Module: 4 Normal distribution	**Assessment Method:** Assignment

The learner can and will be able to:

- Apply the Normal distribution as an approximation to the binomial distribution and complete class-based tasks on the types of distribution.
- Select the appropriate distribution and complete class-based tasks on the selecting types of distribution.
- Use statistical hypothesis testing for the mean of the Normal distribution and complete class based tasks on statistical hypothesis.

There will be an assignment based on the 3 assessment criteria from this learning outcome. This will count as part of the final mark of the learner.

Module: 5 Statistical sampling	**Assessment Method:** Assignment

The learner can and will be able to:

- Critically compare between advantages and disadvantages of sampling and complete class based tasks on sampling.
- Explain the use of sampling techniques related to random sampling and complete class based tasks on sampling techniques and compare sampling techniques in context.

Module: 6 Data presentation and interpretation	**Assessment Method:** Assignment *Examination (Timed)

The learner can and will be able to:

- Perform calculation of measures of location and complete class-based tasks on interpretation of measures of variation.
- Differentiate between diagrams for single-variable data and scatter diagrams and complete class-based tasks on diagrams.
- Explain outliers as draw simple conclusions from statistical problems and complete class based tasks on outliers.

There will be an assignment based on the 3 assessment criteria from this learning outcome. This will count as part of the final mark of the learner.*

Module: 7 Probability	**Assessment Method:** Assignment Examination (Timed)

The learner can and will be able to:

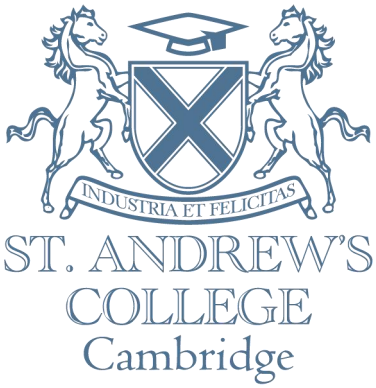
- Can critically compare between mutually exclusive events and independent events and complete class based tasks on events.

There will be an assignment based on the criteria from this learning outcome. This will count as part of the final

mark of the learner.

Module: 8 Statistical distributions	**Assessment Method:** Assignment Examination (Timed)
The learner can and will be able to: - Apply discrete distributions to model real-world situations and complete class based discrete distributions. - Explain the discrete uniform distribution and complete class-based tasks on distributions. There will be an assignment based on the 2 criteria from this learning outcome. This will count as part of the final mark of the learner.	

Module: 9 Statistical hypothesis testing	**Assessment Method:** Assignment Examination (Timed)*
The learner can and will be able to: - Explain the language of hypothesis testing and complete class-based tasks on language hypothesis. - Execute hypothesis tests involving the binomial distribution and complete class based tasks on binomial distribution. There will be an assignment based on the 2 criteria from this learning outcome. This will count as part of the final mark of the learner.* There will be a final exam on the 9 learning outcomes weighing 50% of the final mark of the learner.	



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St Andrew's College Cambridge is part of Dukes Education. Together we're extraordinary