Changes to the IB Diploma Programme computer science courses:
A guide for universities

This report is intended to provide all interested universities with a summary of information on the course content (syllabus outline) and an assessment overview of the IB Diploma Programme computer science course after a recent curriculum review.

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Purpose of this document

This document is primarily intended to assist universities in understanding the computer science courses on offer from 2012 when the new courses begin in schools. It is also anticipated that this document will be of use to other interested parties including governments, parents and students who need an overview of IB Diploma Programme computer science courses in the 16–19 age range and an understanding of how they are structured.

The courses and arrangements described in this document will be valid for teaching from September 2012 (first examinations in May 2014).

The document provides:

- information on the move from group 5: mathematics to group 4: experimental sciences

- an overview of changes in computer science courses

- requirements and rationale for the new courses

- computer science SL syllabus outline and notes on the syllabus and assessment changes

- computer science HL syllabus outline and notes on the syllabus and assessment changes.

Requirements for the IB Diploma Programme

Students may select computer science as their group 4 subject.

Computer science

Computer science will be moving from group 5: mathematics to group 4: experimental sciences for courses starting teaching in September 2012**.** This will reflect the change in emphasis in the computer science subject towards a more scientific approach with computational thinking lying at the heart of the subject. Furthermore, it will become a non-elective subject that will allow students to choose this course as their group 4 subject.

The new programme model is shown below.
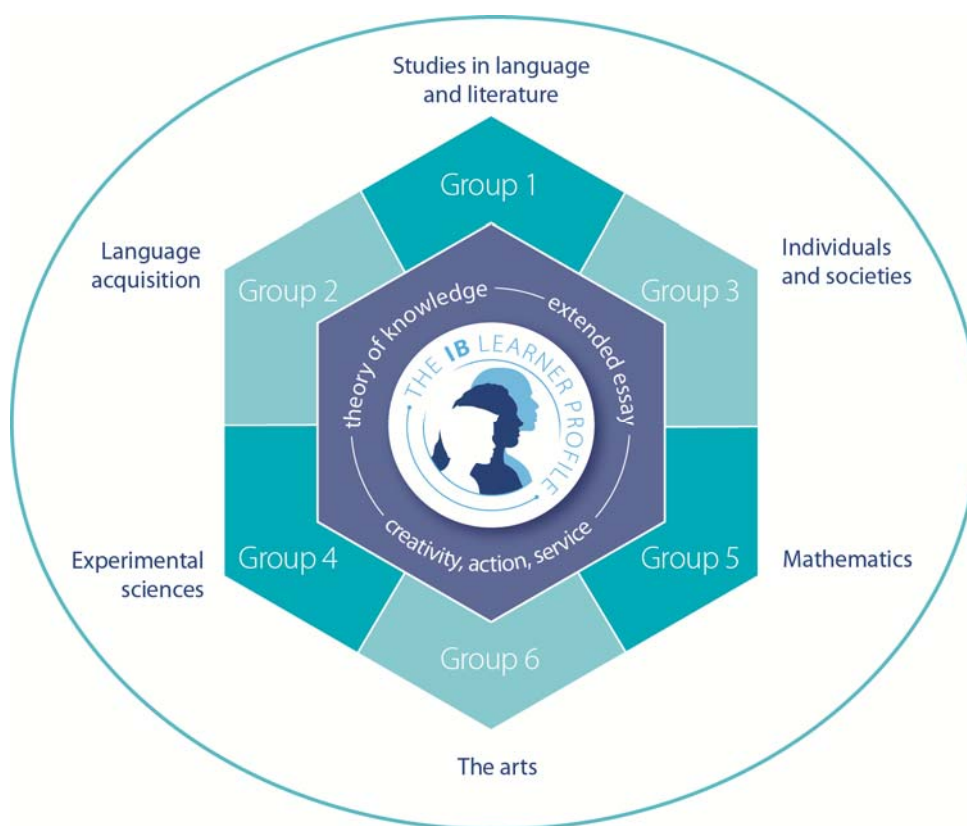
Summary of courses available

Because individual students have different needs, interests and abilities, there are two different courses in computer science. These courses are designed for different types of students:

- those who wish to study computer science in depth, either as a subject in its own right or to pursue their interests in areas related to computer science

- those who wish to gain a degree of understanding and competence to understand better their approach to other subjects

- those who may not as yet be aware how computer science may be relevant to their studies and in their daily lives.

In making this selection, individual students should be advised to take account of the following factors.

- Their own abilities in computer science, mathematics and problem-solving

- Their own interest in computer science, and those particular areas of the subject that may hold the most interest for them

- Their other choices of subjects within the framework of the Diploma Programme

- Their academic plans, in particular the subjects they wish to study in future

- Their choice of career

Teachers are expected to assist with the selection process and to offer advice to students about the suitability of computer science as part of the overall programme of study in the Diploma Programme.

Computer science SL

Past experience shows that students will be able to study computer science at SL successfully with no background in, or previous knowledge of, computer science. Their approach to study, characterized by specific IB learner profile attributes—inquirers, thinkers and communicators—will be significant here. Students who have undertaken the IB Middle Years Programme (MYP) or studied a similar course prior to commencing the IB Diploma Programme would also be well prepared.

Computer science HL

The study of computer science at higher level (HL) demands a higher level of problem-solving skills and the ability to understand and manipulate abstract concepts. Although no previous knowledge of computer science is required, some exposure to programming is desirable.

Computer science SL

Syllabus outline

Syllabus component	Teaching hours
	SL
All topics are compulsory. Students must study all the sub-topics in each of the topics in the syllabus as listed in the *Computer science guide*.	
Topic 1—System fundamentals	20
Topic 2—Computer organization	6
Topic 3— Networks	9
Topic 4—Computational thinking, problem-solving and programming	45
Options Students must study one of the options listed below: ▪ Databases ▪ Modelling and simulation ▪ Web science ▪ Object oriented programming (OOP)	30
Solution The solution is an individual piece of work that develops a solution including a product to a specified problem or unanswered question.	30
Group 4 project A collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared.	10
Total teaching hours	**150**

It is essential that teachers are allowed the prescribed minimum number of teaching hours necessary to meet the requirements of the computer science SL course. At SL the minimum prescribed number of hours is 150 hours.

Notes on the syllabus changes

Current	Change
Program construction in Java lies at the heart of the course.	Computational thinking lies at the heart of the course. This effectively replaces program construction in Java. It is intended to integrate computational thinking with other topics within the course.
There are no options.	Options have been introduced to allow teachers to select a particular strand of the subject that interests them.
The case study is allocated 3 hours of teaching time and does not require extensive research into related fields.	There is no case study. However, the change of emphasis of the subject will ensure the application of knowledge specific to computer science can be applied to a range of scenarios.
There is no mechanism to adapt to rapidly changing technological environments.	Changes in syllabus content may be introduced each May, for first examinations two years later to ensure the course remains current.

Notes on the assessment model

Current	Change
Core time is 125 hours.	Core time has been reduced to 80 hours to accommodate the introduction of options, the group 4 project and the increase in time allocated to the internal assessment.
The examination papers require the understanding and construction of code in Java.	The examination papers focus on algorithmic thinking and the use of pseudo-code. Knowledge of a specific language is not required except for the OOP option.
Both examination papers assess topics within the core. Paper 2 also assesses the case study.	Paper 1 assesses topics within the core. Paper 2 assesses the option chosen.
The internal assessment component is based on Java as the programming language.	The internal assessment component is a more open problem-solving exercise that is not language specific. It enables the development of learners who match the IB learner profile.

Computer science HL

Syllabus outline

Syllabus component	Teaching hours
	HL
All topics are compulsory. Students must study all the sub-topics in each of the topics in the syllabus as listed in the *Computer science guide*.	
Topic 1—System fundamentals	20
Topic 2—Computer organization	6
Topic 3— Networks	9
Topic 4—Computational thinking, problem-solving and programming	45
Topic 5—Abstract data structures	23
Topic 6—Resource management	8
Topic 7—Control	14
Options Students must study one of the options listed below: ▪ Databases ▪ Modelling and simulation ▪ Web science ▪ Object oriented programming (OOP)	45
Solution The solution is an individual piece of work that develops a solution including a product to a specified problem or unanswered question.	30
Case study The knowledge and understanding of additional content, discussion of an issue and/or the formulation of strategies linked to the annually issued case study.	30
Group 4 project A collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared.	10
Total teaching hours	**240**

It is essential that teachers are allowed the prescribed minimum number of teaching hours necessary to meet the requirements of the computer science HL course. The minimum prescribed number of hours is 240 hours.

Notes on the syllabus changes

Current	Change
Program construction in Java lies at the heart of the course.	Computational thinking lies at the heart of the course. This will effectively replace program construction in Java. It is intended to integrate computational thinking with other topics within the course.
There are no options.	Options have been introduced to allow teachers to select a particular strand of the subject that interests them.
The case study is allocated 3 hours of teaching time and does not require extensive research into related fields.	The case study has been developed to act as a stimulus for independent research and to showcase computer science as a rigorous, collaborative and practical problem-solving discipline.
There is no mechanism to adapt to rapidly changing technological environments.	Changes in syllabus content may be introduced each May, for first examinations two years later to ensure the course remains current.

Notes on the assessment model

Current	Change
Program construction in Java lies at the heart of the course.	Computational thinking lies at the heart of the course. This effectively replaces program construction in Java.
The examination papers require the understanding and construction of code in Java.	The examination papers focus on algorithmic thinking and the use of pseudo-code. Knowledge of a specific language is not required except for the OOP option.
Both examination papers (paper 1 and paper 2) assess topics within the core. Paper 2 also assesses the case study.	Paper 1 assesses topics within the core and HL extension. Paper 2 assesses the option chosen. Paper 3 is linked to the annually issued case study.
The internal assessment component is based on Java as the programming language.	The internal assessment component has changed to a more open problem-solving exercise that is not language specific. It enables the development of learners who match the IB learner profile.