IB COMPUTER SCIENCE OVERVIEW AND COURS DESCRIPTION

I. Course description and aims

Computer Science is regarded as an **experimental science**, alongside biology, chemistry, design technology, physics and environmental systems and societies – and sits in the **Group 4** list of subjects. The IB Computer Science course is a rigorous and practical problem-solving discipline.

The IB DP computer science course requires an understanding of the fundamental concepts of computational thinking as well as knowledge of how computers and other digital devices operate. The course, underpinned by conceptual thinking, draws on a wide spectrum of knowledge, and enables and empowers innovation, exploration and the acquisition of further knowledge. Students study how computer science interacts with and influences cultures, society and how individuals and societies behave, and the ethical issues involved. During the course the student will develop computational solutions. This will involve the ability to:

- identify a problem or unanswered question
- design, prototype and test a proposed solution
- liaise with clients to evaluate the success of the proposed solution and make recommendations for future developments.

The aims of the computer science courses are to:

- provide opportunities for study and creativity within a global context that will stimulate and challenge students developing the skills necessary for independent and lifelong learning
- provide a body of knowledge, methods and techniques that characterize computer science
- enable students to apply and use a body of knowledge, methods and techniques that characterize computer science
- demonstrate initiative in applying thinking skills critically to identify and resolve complex problems
- engender an awareness of the need for, and the value of, effective collaboration and communication in resolving complex problems
- develop logical and critical thinking as well as experimental, investigative and problem-solving skills
- develop and apply the students' information and communication technology skills in the study of computer science to communicate information confidently and effectively
- encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.

II. The IB mission statement and the IB learner profile

The Diploma Programme aims to develop in students the knowledge, skills and attitudes they will need to fulfill the aims of the IB, as expressed in the organization's mission statement and the learner profile. Teaching and learning in the Diploma Programme represent the reality in daily practice of the organization's educational philosophy.

III. Assessment model

Having followed the computer science course, students will be expected to:
Know and understand:

- Relevant facts and concepts
- appropriate methods and techniques
- computer science terminology
- methods of presenting information.

Apply and use:

- relevant facts and concepts
- relevant design methods and techniques

- terminology to communicate effectively
- appropriate communication methods to present information.

Construct, analyse, evaluate and formulate:

- success criteria, solution specifications including task outlines, designs and test plans
- appropriate techniques within a specified solution.

Demonstrate the personal skills of cooperation and perseverance as well as appropriate technical skills for effective problem-solving in developing a specified product.

IV. Curriculum model overview

Standard Level (SL)		
Paper 1 Topics 1 to 4	**Paper 2** Option	**Internal Assessment** Coursework
45%	**25%**	**30%**

Higher Level (HL)			
Paper 1 Topic 1 to 7	**Paper 2** Option	**Paper 3** Based on Case Study	**Internal Assessment** Coursework
40%	**20%**	**20%**	**20%**

Components	
Standard Level (SL)	**Higher Level (HL)**
Core syllabus SL/HL core • Topic 1: System fundamentals • Topic 2: Computer organization • Topic 3: Networks • Topic 4: Computational thinking, problem-solving & programming	
	HL extension (For HL Only) • Topic 5: Abstract data structures • Topic 6: Resource management • Topic 7: Control Case study
	Case Study
Option **SL/HL** Students study one of the following options: • Option A: Databases • Option B: Modelling and simulation • Option C: Web science • Option D: Object-oriented programming (OOP) **Internal assessment** Solution Practical application of skills through the development of a product and associated documentation **Group 4 project** Additional subject content introduced by the annually issued case study	

V. How is the course structured?

In the first term of the first year, both SL and HL students will explore theoretical issue of Paper 1 (10 weeks). This will serve as an ideal introduction to the major topic for Paper 2 (15 weeks) – Computational thinking and computer programming. Students finish the year by looking at the Internal Assessment, a first draft of which will need to be completed by the end of term (6-8 weeks). Throughout the year HL students will study HL Extension for Paper 2. In the second year, both SL and HL students will work on topics SL/HL Core which we complete by the end of the first term. We then go into mock examinations, and the remaining time will be spent on revision and study leave for the IB examination.

	IB1		**IB2**	
	SL	**HL**	**SL**	**HL**
Term 1	Paper 1 Paper 2	Paper 1 Paper 2	Paper 2	Paper 3
Term 2	Paper 2	Paper2	Revision	Revision
Term 3	IA	IA	IB Exam	IB Exam

VI. What career paths are open to me?

Computer Science is one of those subjects which can open a number of different career paths, such as in Cyber security, Computer Networking, Telecommunication, Bio-Technology, Biometrics, Ecommerce, Database Management, Mobile Computing, Internet Technology and many more. This is because it provides a foundation upon which we can better understand the world of technology around us.

VII. Computer science and theory of knowledge (TOK)

There is no one scientific method of gaining knowledge or of finding explanations for the behaviour of the natural world. Computer science works through a variety of approaches to produce these explanations, but they all rely on data from observations and have a common underpinning rigour, whether using inductive or deductive reasoning. The explanation may be in the form of a theory, sometimes requiring a model that contains elements not directly observable. Producing these theories often requires an imaginative, creative leap. Where such a predictive theoretical model is not possible, the explanation may consist of identifying a correlation between a factor and an outcome. This correlation may then give rise to a causal mechanism that can be experimentally tested, leading to an improved explanation. All these explanations require an understanding of the limitations of data, and the extent and limitations of our knowledge. Computer science requires freedom of thought and open-mindedness, and an essential part of the process of science is the way the international computer science community shares ideas through academic papers, conferences and open forums.

During the course in computer science a number of issues will arise that highlight the relationships between theory of knowledge and computer science. Some of the questions that could be considered during the course are identified in the following list.

- What is the difference between data, information, knowledge and wisdom? To what extent can computers store and impart data, information, knowledge and wisdom?
- Computational thinking includes: procedure, logic, pre-planning (thinking ahead), concurrency, abstraction and recursion. To what extent are these ways of thinking distinct? To what extent can knowledge in different areas (mathematics, ethics, and so on) be analysed in these ways?
- It has been said that human memory is more like an improvised performance than a movie on a DVD.
- What does this mean? How does human memory differ from computer memory?
- How does a computer language differ from a natural language?

VIII. Computer Science and CAS project?

Choosing to do a CAS Computer science project can better help to understand the importance of the discipline, and how it touches on
the lives of real people. Experience gained will include a reflection to reveal personal growth and mastery of the seven learning outcomes.

Completion of CAS is based on student achievement of the seven CAS learning outcomes:
1. Identify own strengths and develop areas for growth
2. Demonstrate that challenges have been undertaken, developing new skills in the process
3. Demonstrate how to initiate and plan a CAS experience
4. Show commitment to and perseverance in CAS experiences
5. Demonstrate the skills and recognize the benefits of working collaboratively
6. Demonstrate engagement with issues of global significance
7. Recognize and consider the ethics of choices and actions

Through their CAS portfolio, students provide evidence demonstrating achievement of each learning outcomes.

IX. Extended Essay

Is an independent, self-directed piece of research, culminating in a 4000-word essay.

- Emphasis is placed on the research process, on personal engagement in the exploration of the topic and on communication of ideas and development of argument.
- It provides students with the opportunity to engage in personal research in a topic of their own choice.
- It requires approximately 40 hours of work by the student.
- It is compulsory for full Diploma Candidates.
- Externally assessed and, in combination with the grade for Theory of Knowledge, contributes up to 3 points to the total score for the Diploma according to the following matrix

X. Where to find more information about the course?

Please download the Computer Science course outline for more information. Do feel free to email the Computer Science teacher at **j.eddyson@bisc.krakow.pl.**

XI. Suggested reading list

- Computer Science Illuminated by Nell Dale and John Lewis
- Cambridge IGCSE Computer Science by David Watson and Helen Williams
- Computer Science: An Overview by J. Glenn Brookshear and Dennis Brylow
- ***Core Computer Science***: For the IB Diploma Program by Kostas Dimitriou Phd & Markos Hatzitaskos MSc
- IB Computer Science Teacher Guidance (IBO website) – www.ibo.org
- IB Computer Science Guide (official 2014 syllabus)
- IB Computer Science Resources - http://www.ib-computing.net/program/index.html