



**IB WORLD SCHOOL 1309 (ZSO13 Gdańsk)**



**Computer Science SL / HL  
syllabus & course of study**

(based on Computer science guide

First examinations 2014,

4h/week SL, 6h/week HL)

**A. COURSE AIMS:**

1. 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.
2. Provide a body of knowledge, methods and techniques that characterize computer science.
3. Enable students to apply and use a body of knowledge, methods and techniques that characterize computer science.
4. Demonstrate initiative in applying thinking skills critically to identify and resolve complex problems.
5. Engender an awareness of the need for, and the value of, effective collaboration and communication in resolving complex problems.
6. Develop logical and critical thinking as well as experimental, investigative and problem-solving skills.
7. Develop and apply the students' information and communication technology skills in the study of computer science to communicate information confidently and effectively.
8. Raise awareness of the moral, ethical, social, economic and environmental implications of using science and technology.
9. Develop an appreciation of the possibilities and limitations associated with continued developments in IT systems and computer science.
10. Encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.

## **B. COURSE OBJECTIVES:**

1. Know and understand computer science terminology.
2. Apply and use programming methods and techniques.
3. Construct, analyse, evaluate and formulate success criteria, solution specifications including task outlines, designs and test plans.
4. Demonstrate the personal skills of cooperation and perseverance as well as appropriate technical skills for effective problem-solving in developing a specified product.

## **C. COURSE OVERVIEW:**

### **SL/HL CORE:**

Topic 1: System fundamentals (software engineering)

Topic 2: Computer organization (computer architecture, binary representation, logic)

Topic 3: Networks

Topic 4: Computational thinking, problem-solving and programming (algorithms, pseudocode, flowcharts, programming in Java)

### **HL EXTENSION:**

Topic 5: Abstract data structures (2d arrays, recurrence, stacks, queues, trees)

Topic 6: Resource management

Topic 7: Control systems

**SL/HL OPTION:** Object-oriented programming in Java

**GROUP 4 PROJECT** - a collaborative activity where students from different group 4 subjects work together on a scientific or technological topic

### **Textbook:**

Computer Science, Kostas Dimtriou, Markos Hatzitaskos, Express 2015

Advanced Computer Science, Kostas Dimtriou, Markos Hatzitaskos, Express 2016

### **Software:**

IntelliJ IDEA Community

#### D. COURSE OF STUDY

<b>Topic / Option</b>	<b>Content</b>	<b>Minimum time (hours)</b>
1. System fundamentals	Planning and system installation. User focus. System backup. Software deployment. Components of a computer system. System design and analysis. Human interaction with the system.	20
2. Computer organization	Computer architecture. Secondary memory. Operating systems and application systems. Binary representation. Simple logic gates.	6
3. Networks	Network fundamentals. Data transmission. Wireless networking.	9
4. Computational thinking, problem-solving and programming	Java programming (conditional statements, loops, arrays, methods, JavaFX). Flowcharts. Pseudocode. Linear and binary search. Bubble and selection sort.	45
5. Abstract data structure	Thinking recursively. Linked list. Stacks. Queues. Binary Searched Trees.	23
6. Resource management	System resources. Role of the operating system.	8
7. Control	Centralized and distributed control systems.	14
Option D. Object-oriented programming	Program development (applications with SQLite database, REST API, Firebase).	30

## E. ASSESSMENT

SL:

Assessment component	Weighting
<b>External assessment (2 hours 30 minutes)</b>	<b>70%</b>
<b>Paper 1 (1 hour 30 minutes)</b> Paper 1 is an examination paper consisting of two compulsory sections. <ul style="list-style-type: none"><li>• Section A (30 minutes approximately) consists of several compulsory short answer questions. The maximum mark for this section is 25.</li><li>• Section B (60 minutes approximately) consists of three compulsory structured questions. The maximum mark for this section is 45.</li></ul> (70 marks)	<b>45%</b>
<b>Paper 2 (1 hour)</b> Paper 2 is an examination paper linked to the option studied. The paper consists of between two and five compulsory questions. (45 marks)	<b>25%</b>
<b>Internal assessment (40 hours)</b> This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.	<b>30%</b>
<b>Solution (30 hours)</b> The development of a computational solution. Students must produce: <ul style="list-style-type: none"><li>• a cover page that follows the prescribed format</li><li>• a product</li><li>• supporting documentation (word limit 2,000 words).</li></ul> (34 marks)	
<b>Group 4 project (10 hours)</b> To be assessed using the criterion Personal skills. (6 marks)	

## HL

Assessment component	Weighting
<b>External assessment (4 hours 30 minutes)</b>	<b>80%</b>
<b>Paper 1 (2 hours 10 minutes)</b> Paper 1 is an examination paper consisting of two compulsory sections. <ul style="list-style-type: none"><li>• Section A (30 minutes approximately) consists of several compulsory short answer questions. The maximum mark for this section is 25.</li><li>• Section B (100 minutes approximately) consists of five compulsory structured questions. The maximum mark for this section is 75.</li></ul> (100 marks)	<b>40%</b>
<b>Paper 2 (1 hour 20 minutes)</b> Paper 2 is an examination paper linked to the option studied. The paper consists of between three and seven compulsory questions. The SL/HL core questions are common and worth 45 marks, HL extension is worth 20 marks. (65 marks)	<b>20%</b>
<b>Paper 3 (1 hour)</b> Paper 3 is an examination paper of 1 hour consisting of four compulsory questions based on a pre-seen case study. (30 marks)	<b>20%</b>
<b>Internal assessment (40 hours)</b> This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.	<b>20%</b>
<b>Solution (30 hours)</b> The development of a computational solution. Students must produce: <ul style="list-style-type: none"><li>• a cover page that follows the prescribed format</li><li>• a product</li><li>• supporting documentation (word limit 2,000 words).</li></ul> (34 marks)	
<b>Group 4 project (10 hours)</b> To be assessed using the criterion Personal skills. (6 marks)	

Note: The use of calculators and computers is not permitted in any computer science examination.

### Internal assessment max marks

Criterion	Marks	Description (for max marks)
A. Planning	6	An appropriate scenario for investigation for an identified client, providing evidence of consultation, is described. The rationale for choosing the proposed product is justified and includes a range of appropriate criteria for evaluating the success of the product.
B. Solution overview	6	The record of tasks and the design overview, including an outline test plan, are detailed and complete. From this information it is clear how the product was developed.
C. Development	12	The use of techniques demonstrates a high level of complexity and ingenuity in addressing the scenario identified in criterion A. It is characterized by the appropriate use of existing tools. The techniques are adequate for the task and their use is explained. All sources are identified.
D. Functionality and extensibility of product	4	The video shows that the product functions well. Some expansion and modifications of the product are straightforward.
E. Evaluation	6	The product is fully evaluated against the success criteria identified in criterion A including feedback from the client/adviser. Recommendations for further improvement of the product are realistic.