Computer Science

Year 1&2

Course description 2019/2020

WHAT IS THE COURSE ABOUT?

Computer Science is regarded as an experimental science 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.

AIMS:

The aims of teaching and studying CS 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.

OBJECTIVES:

Having followed the computer science course, students will be expected to achieve the following objectives:

1. Know and understand:
   - relevant facts and concepts
   - appropriate methods and techniques
   - computer science terminology
   - methods of presenting information.

2. Apply and use:
   - relevant facts and concepts
   - relevant design methods and techniques
   - terminology to communicate effectively
   - appropriate communication methods to present information.

3. Construct, analyse, evaluate and formulate:

   - success criteria, solution specifications including task outlines, designs and test plans

   - appropriate techniques within a specified solution.

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

ASSESSMENT:

- **Knowledge and understanding** (50% of class grade) :

   o **Unit tests** are written after the completion of each unit. Duration of a test is 1 or 2 school hours.

   o **Quizzes** are written approximately two times per month (depending on unit), containing short answer questions with working time of 15 minutes. Grade is given as the average result of two consecutive quizzes

   Examples**:** definitions, explanations…

- **Application of knowledge/Practical work** (30% of class grade):

   o **Quizzes:** Written approximately two times per month (depending on unit) with working time of 15 minutes. Grade is given as the average result of two consecutive quizzes. Examples: data representation, logic gates, algorithms, flowcharts, programming etc.

   o **Programming assignments** – on the computer

   o **Solution (Year 2):** Solution is a piece of work which includes: report on exploration of a topic in which a student is genuinely interested and product developed through different stages. It is assessed according the IB criteria descriptors.

- **Engagement** (20% of class grade): essays, presentations, participation in class

- **Semester/Mock Exam:**

   Year 1 – Paper 1

   Year 2 – Paper 1 and Paper 2

   (two grades are provided (P1 and P2) for each part of the exam.)

Throughout course teacher uses **formative assessments** to determine students' strengths and limitations in accessing required content knowledge and skills, provide needed support in making progress and to allow for students to actively engage in and reflect on their educational experience in each class. While preparing students for the summative assessments, teachers use a variety of formative assessments to scaffold student development of content knowledge and skills.

All pieces of work will be marked on the 1 to 7 grading scale.

GRADING SCALE:

grades	unit tests (%), quizzes	semester exams (%)
7	90-100	86-100
6	78-89	71-85
5	65-77	55-70
4	51-63	45-54
3	39-50	31-44
2	26-38	15-30
1	0-25	0-14

At the end of the year the class grade is calculated as follows:

Year 1	Year 2
Class grade - 65% Mock exam Paper 1 - 35%	Class grade - 60% Mock exam Paper 1 - 20% Mock exam Paper 2 - 20%

IMPLEMENTATION:

The school offers only Standard Level course.

DP Year 1: 4 lessons per week

DP Year 2: 3 lessons per week

TOPICS:

The syllabus for the Diploma Programme Computer Science course is divided into 2 parts: Core material (4 topics) and Options (1 out of 4). The **Core material** is compulsory and is divided into 4 topics: "System fundamentals", "Computer organization", "Networks" and "Computational thinking, problem solving and programming". The **Optional Material** consists of one of the following topics: "Databases", "Modelling and simulation", "Web science" and "Object oriented programming". Computer science course in our school is taught through the following units which cover all listed topics:

Unit 1	**Computer organization – computer architecture**	The aim of this topic is to introduce basic concepts of computer architecture – how computers and other digital devices operate.
Unit 2	**Computer organization – data representation**	The aim of this topic is to introduce basic concepts of different representation of data in a computer.
Unit 3	**Computational thinking, problem-solving and programming - pseudocode**	The aim of this topic is to introduce basic concepts of computational thinking, problem solving and programming in pseudocode.
Unit 4	**Computational thinking, problem-solving and programming – Java**	The aim of this topic is to introduce basic concepts of computational thinking, problem solving and programming in programming language Java.
Unit 5	**Object oriented programming - Java**	The aim of this topic is to introduce basic concepts of object-oriented programming in Java and to provide opportunity for students to engage in logical reasoning, algorithmic thinking and applications.
Unit 6	**Networks**	The aim of this topic is to introduce basic concepts of computer networks.
Unit 7	**System fundamentals**	The aim of this unit is to introduce basic concepts od systems in different organizations and system life cycle.

Textbooks:

Dale, Lewis: *Computer Science Illuminated*, Jones & Bartlett Learning, 2013 (5th edition) or 2016 (6th edition)

Document adapted from:

Computer Science guide for Diploma Programme – first examinations in 2014 (published in 2012)