

**Continual Renewal of Senior Secondary Subjects
School Survey on Proposed Changes to:**

Information and Communication Technology

Purpose and Design of the Questionnaire

The purpose of this questionnaire is to solicit views of the subject panel heads and teachers on some changes proposed for the curriculum and/or assessment of the above-mentioned subjects. **Subject panel heads and teachers are advised to exchange their views, and may also discuss with the School Principal, before responding to the questions.** The items in this questionnaire are by no means exhaustive, and views on issues that are not included can be collected through other channels, e.g. written submissions, briefings, forums and interviews. Subject panel heads and teachers are also welcome to express their views under “Other comments” in this questionnaire. Views collected from schools through this questionnaire will be **subjected to further professional discussion** in the relevant Curriculum Development Council (CDC) / Hong Kong Examinations and Assessment Authority (HKEAA) committees, and deliberated by the CDC and the HKEAA Public Examinations Board at a later stage for a final decision, if necessary. A briefing session will be held on 28 May 2018 to explain the proposed recommendations and to collect feedback. Details will be posted through the Training Calendar System.

Background

With the completion of the New Academic Structure Medium-term Review in June 2015, the ongoing review of the curriculum and assessment of senior secondary subjects continues following the development, implementation and review cycle of each subject. The CDC, HKEAA and Education Bureau (EDB) have been collecting feedback from stakeholders, aiming to continue to improve the implementation of the senior secondary curriculum and assessment. For the Information and Communication Technology (ICT) curriculum, based on the professional discussion of relevant committees and the feedback collected from various stakeholders, some proposed changes to the curricula have been formulated.

Return of Completed Questionnaires

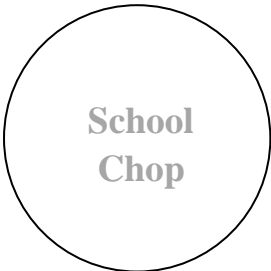
Your school is expected to **return ONE questionnaire only.** The panel head should consolidate all panel members’ views on this questionnaire, and return it by fax or by mail (**page 2-5 only**) to Technology Education Section of the EDB (W101, 1/F, West Block, 19 Suffolk Road, Kowloon) **on 25 June 2018.** For enquiries on return of the questionnaires, please contact Mr Sean LIU at 3698 3130. For enquiries on the proposed changes in the subject, please contact Mr Michael LUI at 3698 3129. All information provided will be kept strictly confidential and will *only* be used for the purpose of the continual renewal of the curriculum and assessment of the above-mentioned subjects. No information on individual schools/teachers will be revealed.

To: Technology Education Section, Education Bureau (Attn: Mr Sean LIU)

Fax: 2768 8664

Continual Renewal of Senior Secondary Subjects
School Survey on Proposed Changes to:

Information and Communication Technology

<p>School Name: _____</p> <p>Name of Contact Person: _____ Tel.: _____</p> <p>Principal's Name: _____</p> <p>Principal's Signature: _____</p>	<p>School Number:</p> <table border="1"><tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table> <p style="text-align: center;"></p>						

Information and Communication Technology

Preamble

Further to the New Academic Structure Medium-term Reviews, the updated Information and Communication Technology (ICT) curriculum has been first implemented in Secondary 4 in 2016/17 school year and the public examination will be held in 2019, the CDC-HKEAA ICT Committee (hereinafter referred to as the Committee) conducted a surveys in the Jan 2015 and used other means to gather teachers' views on the curriculum and the assessment arrangements (i.e. the public examination and the School-based Assessment).

After a detailed analysis and thorough discussions on the feedback collected, some recommendations were proposed from the Committee. Given the growth in the use of computers, algorithms and data in many fields, the recommendations were focused on enhancing the programming elements on the Compulsory Part of the curriculum so as to develop students' Computational Thinking (CT).

Please refer to Annex 1 for the details of the proposed changes for the curriculum.

Please blacken the appropriate circle. State your views and provide information in the space provided when necessary.

Proposed Changes to Curriculum and Assessment

This section collects views of subject panel heads and teachers on the recommendations for future development of the senior secondary curriculum and assessment for the subject. Some of the recommendations are proposed to be implemented with a specific time frame while others serve to set the direction for future exploration and discussion. The time frame for each recommendation (i.e. Curriculum and Public Assessment) is clearly indicated in the respective items.

Curriculum

(Teaching at S4 in the 2021/22 school year, leading to the 2024 HKDSE)

Please refer to Annex 1 for the proposed changes for the Compulsory Part of Information and Communication Technology curriculum.

1. Do you agree with the proposed changes for the Compulsory Part of Information and Communication Technology curriculum? [Annex 1]

Modules in the Compulsory Part	Agree	Disagree	No Opinion	Comments
A. Information Processing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
B. Computer System Fundamentals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
C. Internet and its Applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
D. Basic Programming Concepts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
E. Social Implications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Other comments: _____

2. Do you agree that the programming languages C++, Pascal and Python will be used in parallel in the 2024 HKDSE examination for the Compulsory Part and the elective option “Software Development”?

- Agree
- Disagree
- No opinion

Other comments: _____

3. Suggestions for the future development of the curriculum of the elective options:

Options in Elective Part	Content to be trimmed	Content to be enriched
<p>A. Databases</p> <ul style="list-style-type: none"> a. Introduction to Databases b. Relational Databases c. Introduction to Database Design Methodology d. Database Applications, Development and Society 		
<p>B. Data Communications and Networking</p> <ul style="list-style-type: none"> a. Data Communications and Networking Basics b. Network Design and Implementation c. Network Management and Security 		
<p>C. Multimedia Production and Web Site Development</p> <ul style="list-style-type: none"> a. Multimedia Production b. Web Site Development 		
<p>D. Software Development</p> <ul style="list-style-type: none"> a. Programming b. Programming Languages c. Systems Development 		

Other comments: _____

4.	Do you agree to include the following learning elements in the Option D, Software Development on the Elective Part?				
	New learning elements	Agree	Disagree	No Opinion	Comments
	A. Binary trees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	B. Hash tables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	C. Concept of recursion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	D. Quick sort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	E. Manipulation of random files	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
F. Project Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
5.	Please suggest support measures required for the subject:				
Other Comments					
6.	<hr/> <hr/>				

Background Information:

7. Please indicate the provision of Information and Communication Technology in your school:
- This subject is offered in the 2017/18 school year with elective option(s) _____ (Please fill in elective option(s) A / B / C / D offered in school)
 - This subject has not been offered
 - This subject has not been offered but will be offered in _____ (please fill in the school year)

– The End –

Thank you very much!

Proposed changes for the Compulsory Part of Information and Communication Technology curriculum

A. Information Processing

The time allocation for the module is about 37.52-hours.

This module comprises four five topics: “Introduction to Information Processing”, “Organisation and Data Control”, “Data Representation” and–“The Use of Office Automation Software” and–“~~Presentation of Information~~”.

Topic	Learning Outcomes	Remarks
a. Introduction to Information Processing (<u>35</u> hours)	<ul style="list-style-type: none"> Describe the basic concepts of the Input-Process-Output cycle and the use of a stored program in a processing system. 	
c. Data Representation (10 hours)	<ul style="list-style-type: none"> Know briefly how different multimedia elements are digitised. Convert them into different file formats and compare them for storing the same data. 	Elementary file conversion is required but not the editing of a file. Students should be given the experience in creating various file formats such as wav vs. mp3, bmp vs. jpg, and avi vs. mpeg2. Common file formats such as <u>bmp, png, jpg, wav, mp3, avi, mpeg4, txt, docx, odt and pdf.</u>

Topic	Learning Outcomes	Remarks
<p>d. The Use of Office Automation Software (20-28 hours)</p>	<ul style="list-style-type: none"> ● Design and create formatted documents or reports effectively and suitably using a word-processing tool. ● Use a software suite in an integrated and effective manner. 	<p>Through meaningful tasks related to the real world, such as advertisements, fliers, newsletters and reports, students are expected to apply formatting features such as tables, columns, text frames and graphics, with consideration of the use of colour, size and positioning in presenting their documents.</p> <p>Other features such as table of contents and hyperlinks should be introduced to students to facilitate the writing of a report and to enhance the readability of documents.</p> <p>–</p> <p>Examples of text formats are rich text format, portable document format and word document format.</p> <p>Students should be given experience of the integrated use of different programs in the software suite (e.g. spreadsheet / databases with word documents in mail-merging).</p>
<p>e. Presentation of Information (5 hours)</p>	<ul style="list-style-type: none"> ● Construct and design a presentation incorporating multimedia elements. 	<p>The focus is on the planning of the storyboard and presentation, not the means of presentation. Students may choose a web-based presentation, a slide show, a multimedia document or other means of presentation. The presentation should be supplemented with verbal annotation, to develop students' communication skills and encourage them to articulate ideas / thoughts.</p>

B. Computer System Fundamentals

The time allocation for the module is about 22 25 hours.

Details

This module comprises two ~~three~~ topics: “Basic Machine Organisation” and, “System Software” ~~and~~ “Computer Systems”.

Topic	Learning Outcomes	Remarks
a. Basic Machine Organisation (15 hours)	<ul style="list-style-type: none"> Outline the steps in the fetch-decode-execute cycle and store using a single processor, and describe the roles of and the interdependence among components, registers and buses in the machine cycle. 	<p>The functions of the program counter, accumulator, instruction register, memory address register and memory data register should be briefly introduced to students. No assembly language is involved. but instructions requiring LOAD, ADD, STORE and STOP may be used to illustrate how data and instructions are processed in the machine cycle.</p>
b. System Software (74 hours)	<ul style="list-style-type: none"> <u>Distinguish the characteristics and applications of various modes of operation.</u> 	<p><u>Modes of operation to be considered are batch processing, real-time processing, parallel processing, distributed processing, and virtualization.¹</u></p>
c. Computer Systems (6 hours)	<ul style="list-style-type: none"> Compare the characteristics of different types of computers. 	<p>Types of computers include personal computers, mainframes, supercomputers, network computers, etc. Comparison should be made with respect to physical size, memory size, backing store capacity, input/output devices, processors, number of user supported, cost and applications.</p>

¹ Batch processing, real-time processing, parallel processing, distributed processing are moved from Topic c. “Computer System” to Topic b. “System Software”.

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> Distinguish the characteristics and applications of various computer systems. 	Computers systems to be considered are batch processing systems, on-line interactive systems and real-time systems, single-user systems and multi-user systems, parallel processing systems and distributed processing systems, and network systems.

C. Internet and its Applications

The time allocation for the module is about ~~31~~ 22 hours.

Details

This module comprises ~~four~~ three topics: “The Networking and Internet Basics”, “Internet Services and Applications” ~~and~~ “Elementary Web Authoring ~~and~~ “Network Security”.

Topic	Learning Outcomes	Remarks
a. The Networking and Internet Basics (9 hours)	<ul style="list-style-type: none"> <u>Know the basic concepts of IP addressing with a view of evolutionary prospective.</u> Understand the need for communications software and communication protocols. Describe how data is transmitted over the Internet and understand concepts of Internet Protocol (IP), Uniform Resource Locator (URL), Domain Name System (DNS), Hypertext Transfer Protocol (HTTP) and <u>Hypertext Transfer Protocol Secure (HTTPS)</u>File Transfer Protocol (FTP). 	<u>Technical details of IPv6 are not required.</u> <u>This includes simple concepts of TCP/IP.</u>

Topic	Learning Outcomes	Remarks
<p>c. Elementary Web Authoring (38 hours)</p>	<ul style="list-style-type: none"> • Design and construct<u>Discuss the organisation of</u> web pages for an intended audience and upload them onto the World Wide Web. 	<p>The organisation of information includes ease of navigation, appropriate placement of links, tables, frames and multimedia elements, colour combinations, background design, font size and style, for an intended audience.</p> <p>Students are not required to memorise HTML codes.</p>
<p>d. <u>Network Security</u> (14 hours)²</p>	<ul style="list-style-type: none"> • <u>Describe the potential risks caused by the common network security threats.</u> • <u>Propose effective measures to improve network security.</u> 	<p><u>The threats include virus, worm and Trojan programs, spyware, ransomware, unauthorised access, interception, intrusion via dynamic web pages and Denial of Service (DoS) attack, etc.</u></p> <p><u>The measures include browser setting, anti-virus software, authentication, access and user right control, firewall, wireless security protocol such as WPA, and Virtual Private Network (VPN), etc.</u></p>

² The learning outcomes and the remarks of the new topic d. “Network Security” are moved from the Topic d. “Threat and Security on the Internet” in Module E. “Social Implications”.

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> <li>• <u>Discuss the possible privacy threats on the Internet, and suggest ways to maintain privacy.</u> <li>• <u>Be aware of information encryption technologies so as to prevent eavesdropping and interception.</u> <li>• <u>Explain authentication and authorisation as a means to control access of information on the Internet.</u> <li>• <u>Know about security used in electronic transactions.</u> 	<p><u>Supported by crimes reported in the news, violation of the secrecy of data as a result of eavesdropping, hacking, phishing, spamming and junk mails etc. should all be considered and discussed with students.</u></p> <p><u>The ways to maintain privacy, such as anonymity and passwords, should be stressed.</u></p> <p><u>Teachers can quote some of the legal consequences related to unauthorised access to computers.</u></p> <p><u>This includes the basic concepts of data encryption, public and private key encryption systems, and the relationship between the size of the key used and the degree of security, e.g. Hong Kong Public Key Infrastructure (PKI).</u></p> <p><u>Basic concepts include the authentication methods for individuals, types of tokens used in authentication processes, and digital certificates and the procedures involved in obtaining a certificate.</u></p> <p><u>The concepts of Secure Sockets Layer (SSL) in secured transmission in e-commerce should be introduced.</u></p> <p><u>Other security measures in online transaction such as smart cards, security tokens, digital certificates and mobile Short Message Service (SMS) should also be introduced.</u></p>

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> • <u>Be aware of the latest developments in security measures.</u> 	

D. Basic Programming Concepts Computational Thinking and Programming Concepts

The time allocation for the module is about ~~24~~48 hours.

The programming languages C++, Pascal and Python are suggested to be used in parallel in the HKDSE examination for the Compulsory Part and the elective option “Software Development”.

Details

This module comprises ~~four~~three topics: “Problem Formulation and Problem-Solving Problem-Solving Procedures”, “Algorithm Design”, “Program Development” and “Program Testing and Debugging Algorithm-Testing”.

Topic	Learning Outcomes	Remarks
<p>a. <u>Problem Formulation and Problem-Solving Problem-Solving Procedures</u> (54 hours)</p>	<ul style="list-style-type: none"> • Outline the major stages in problem-solving and explain the needs of each stage. • Use real-life examples to illustrate the various stages in problem-solving procedures. • Explain the importance of formulating and defining<u>Define</u> the scope of a problem precisely. • <u>Define and state a problem by identifying required inputs, outputs and stating the processes required.</u> 	<p>Examples:</p> <ul style="list-style-type: none"> • <u>Calculate interest on mortgages and print instalments over a period of time</u> • <u>Find the Body Mass Index (BMI) to monitor for healthy weight</u> • <u>Program a robot to detect and trace lines</u>

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> • <u>Solve a problem by decomposing them into smaller and manageable sub-problem</u>breaking it down into sub-problems or modules. • <u>Identify common elements across similar problems.</u> 	<p>The sub-problems, for instance, may represent the input, process and output of the solution to the problem.</p> <p><u>Example:</u></p> <ul style="list-style-type: none"> • <u>Identify the patterns of methods for sorting the height of a group of students in ascending order and then modify the methods to sort the weight of a group of students in descending order.</u> • <u>Identify the patterns of methods for controlling an object to move in a square path and then modify the methods to let the object to move in other polygonal paths.</u>
<p>b. Algorithm Design (1213-hours)</p>	<ul style="list-style-type: none"> • <u>Perform a dry run of a set of steps to determine its purpose and/or output.</u> • Define algorithm. Use pseudocode and program flowchart as methods for representing algorithms. • Outline and discuss the input and output requirements of a problem, and design an appropriate user interface. 	

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> • Recognise the uses and nature of simple data types and data structures in solving a problem. • Select appropriate data types for the solution to a particular problem and discuss the merit of the chosen types. • Design and construct standard algorithms involving basic control structures. • Create and examine algorithms such as to load and print an array, and to add or delete an item from an array. • <u>Produce trace table to show value of variables at each stage in set of steps.</u> • <u>Locate logic error in an algorithm, and correct or modify an algorithm to remove the errors or for changes in task specification.</u> 	<p>Simple data types are restricted to integer, real, character and Boolean while simple data structures are limited to string and one-dimensional array. Boolean logic (AND, OR, NOT) and truth tables should be introduced.</p> <p>The control structures are sequence, selection (binary and multi-way) and iteration (pre-test, post-test and for loops).</p>

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> Describe the advantages of modularity in designing computer solutions. 	<p>When designing a solution to a complex problem, students should be encouraged habitually to use the modular approach to structure the algorithm.</p>
<p>c. <u>Program Development (20 hours)</u></p>	<ul style="list-style-type: none"> <u>Understand and use variables, constants, and simple lists (1-D array) in different problem contexts.</u> <u>Use operators, expressions, assignment statements, input and output statements.</u> <u>Understand and use sequence, selection and iteration (nested loop is not required) constructs to create a program</u> 	<p><u>Examples of arithmetic operators include addition, subtraction, multiplication, division, and modulus.</u></p> <p><u>Examples of relational operators include equal to, not equal to, greater than, greater than or equal to, less than and less than or equal to.</u></p> <p><u>Examples of Boolean expression include AND, OR and NOT.</u></p>

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> • <u>Produce programming solution for a given problem.</u> 	<p><u>Examples:</u></p> <ul style="list-style-type: none"> • <u>Find the minimum, maximum and average values in a list</u> • <u>Search for an item in a list and report the result of the search</u> • <u>Find the length of a string of characters</u> • <u>Extract required characters from a string of characters</u> • <u>Count the number of items, which meet specified criteria in a list</u> • <u>Check if the values in a list are in order</u> • <u>Use of mathematical formulas</u>
<p><u>d. e. Program Testing and Debugging</u> <u>Algorithm Testing</u> (11.7 hours)</p>	<ul style="list-style-type: none"> • <u>Apply data validation check to design appropriate test data. Trace and test algorithms.</u> • <u>Understand and describe types of program errors: syntax, logic and run-time; explain why they occur and debug.</u> 	<p>Students should be able to trace and test an algorithm with manual methods or using some tools, such as Scratch, Microsoft Small Basic, or Raptor. The idea of debugging should also be introduced. Students need to identify boundary cases and generate appropriate test data.</p> <p>Recall of specific operation/command of the tools is not required.</p> <p><u>Students need to identify boundary cases. –</u></p>

Topic	Learning Outcomes	Remarks
	<ul style="list-style-type: none"> Compare different solutions to the same problem. 	Comparison of the steps of operation and resource usage of different programs to solve the same problem should be encouraged.

E. Social Implications

The time allocation for the module is about ~~722~~ hours.

Details

This module comprises ~~three four~~ topics: “Equity of Access”, “Work and Health Issues” and, “Intellectual Property” ~~and “Threats and Security on the Internet”~~.

Topic	Learning Outcomes	Remarks
b. Work and Health Issues (2 hours)	<ul style="list-style-type: none"> Realise that technological innovations can bring major benefits to society if they are used properly, but damage society when they are misused. 	<u>Examples of technologies are artificial intelligence (AI), Big Data.</u>
c. Intellectual Property (36 hours)	<ul style="list-style-type: none"> Understand the basic ideas of intellectual property and copyright. Know the difference between open source and non-open source software. <u>Understand</u>Debate the benefits and risks of different licensing schemes such as freeware, shareware, open source software and copyrighted software from the perspectives of users and software developers. 	
d. Threat and Security on the Interest (12 hours) ³		

³ The learning outcomes and remarks are subsumed to a new Topic d. “Network Security” in Module C. “Internet and its Applications”.