**Sample Course Outline**

Computer Science

ATAR Year 11

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Sample course outline

Computer Science – ATAR Year 11

Semester 1 – Unit 1 (Design and development of programming and network solutions)

| **Week** | **Syllabus Content** | |
| --- | --- | --- |
| **Knowledge** | **Skills** |
| 1–3 | Introduction  * overview of Semester 1 * assessment requirements  Programming *Programming skills and concepts*   * characters represented as numbers in binary, decimal and hexadecimal * program control structures   + sequence   + selection   + iteration * modular coding using functions, parameters and arguments   + scope of variables (Global, Local) * data types used in solutions, including:   + integer   + float   + string   + Boolean * types of operators:   + arithmetic operators (+, -, \*, /, % or MOD)   + relational operators (==, !=, >, <, >=, <=)   + logical operators (AND, OR, NOT) | Programming *Programming skills and concepts*   * apply, using pseudocode and a programming language, the following program control structures   + sequence   + selection   + iteration * use modular coding using functions, parameters and arguments   + scope of variables (Global, Local) * apply, using pseudocode and a programming language, data types used in solutions, including:   + integer   + float   + string   + Boolean * use different types of operators:   + arithmetic operators (+, -, \*, /, %)   + relational operators (==, !=, >, <, >=, <=)   + logical operators (AND, OR, NOT) |
| 4 | * identify the characteristics of the following data structures:   + one-dimensional array | * read and write complex logical expressions including Boolean operators   + AND, OR, NOT   + logical order of precedence * apply, using pseudocode and a programming language the following data structures:   + one-dimensional array |
| 5–6 | *Good programming practice*   * Framework for development   + investigate     - problem description     - define requirements     - development schedule   + design     - design data structures     - design and test algorithm   + develop     - develop and debug code     - unit testing and use of live data   + evaluate     - user acceptance testing     - developer retrospective * good programming practice, including:   + validate input before processing   + use of meaningful variable names   + use constants for readability and maintenance   + use of comments to explain code   + appropriate use of standard control structures   + use of appropriate indentation and white space   + one logical task per module   + meaningful names for modules   + exception handling | *Good programming practice*   * apply the framework for development * apply good programming practice, including:   + validate input before processing   + use of meaningful variable names   + use constants for readability and maintenance   + use of comments to explain code   + appropriate use of standard control structures   + use of appropriate indentation and white space   + one logical task per module   + meaningful names for modules   + exception handling |
| 7–8 | *Structured algorithms*   * benefits of using structured algorithms   + ease of development   + ease of understanding   + ease of modification * using pseudocode for representing algorithms * efficient algorithm design   + use of a modular approach   + structure charts as a design tool   + use of stubs to represent incomplete modules | *Structured algorithms*   * using pseudocode to represent algorithms   + design efficient algorithms   + use of a modular approach   + structure charts as a design tool   + use of stubs to represent incomplete modules * use of standard algorithms   + processing of arrays, including:     - load an array and print its contents     - add the contents of an array of numbers     - identify position of minimum or maximum value   + processing of sequential text files, including:     - open for read, write and append     - read and process data     - write and append content     - close |
| 9–10 | *Testing*   * appropriate test data, including:   + data that test all the pathways through the algorithm   + data that test boundary conditions ‘at’, ‘above’ and ‘below’ values upon which decisions are based   + data where the required answer is known   + type and range checking   *Error detection and debugging code*   * type of coding errors, including: * syntax error * runtime errors * logic errors   *Ethical and legal implications of software development*   * concepts associated with piracy and copyright, including:   + intellectual property     - plagiarism in relation to the acknowledgement of code     - Australian copyright laws   + software licensing (as per syllabus support document)   *External modules*   * API (application programming interface)   + purpose of an API   + use of an API when developing software | *Testing*   * identify and select appropriate data to test an algorithm, including:   + data that tests all the pathways through the algorithm   + data that tests boundary conditions ‘at’, ‘above’ and ‘below’ values upon which decisions are based   + data where the required answer is known   + type and range checking * testing both algorithms and coded solutions with test data, such as:   + desk checking an algorithm (trace table)   + stepping through a coded solution   *Error detection and debugging code*   * debugging output statements   + additional print statements in the code for use in the debugging process     - used to identify which sections of the code have been executed     - used to interrogate variable contents at a particular point in the execution of a program |
| 11–12 | Network Communications *Models of Networking*   * purpose of Department of Defense Transmission Control Protocol/Internet Protocol (DoD TCP/IP model) * layers of DoDTCP/IP model   + application   + transport   + internet   + network * role of layers within the model * key protocols associated with layers * role of IP addresses * role of subnet masks * key differences between IPv4 vs IPv6   *Network components*   * the function of networking components at different layers of TCP/IP model   + transmission media (UTP, fibre optics, wireless)   + router   + switch   + wireless access point   + firewall   *Network security*   * need for preventing unauthorised access to a network * role of firewalls in securing networks * role of operating systems in network security |  |
| 13–14 | *Network performance*   * factors that affect network performance:   + bandwidth   + network design   + data collisions   + excess broadcast traffic | *Network performance*   * create network diagrams using the CISCO network diagrammatic conventions to represent network topologies for LAN, WLAN and WAN |
| 15 | Revision | |
| 16 | Semester 1 examination | |

Semester 2 – Unit 2 (Design and development of database solutions and cyber security considerations)

| **Week** | **Syllabus Content** | |
| --- | --- | --- |
| **Knowledge** | **Skills** |
| 1–2 | Course review  * review Unit 1 * review assessment requirements * overview of Semester 2  Cyber security *Ethics and Law*   * role of ethical hacking in network security   + purpose (improving security)   + penetration testing   + comparison with unethical hacking * role of the *Privacy Act 1988* * the concept of the Australian privacy principles * Australian Privacy Principles in relational to keeping data secure   *Network security*   * authentication   + characteristics of strong passwords   + organisational approach to password policies   + password policies impact on data security   + two-factor authentication   + biometrics * encryption   + purpose of encryption   + public vs private key encryption |  |
| 3–4 | *Network Threats*   * distinguish between the different methods used to compromise the security of a system:   + social engineering (phishing)   + denial of service   + back door   + IP spoofing   + SQL injection   + man-in-the-middle   + cross site scripting   + types of malware(as per syllabus support document)   + physical security threats   + zero day vulnerabilities   *Cryptography*   * purpose of cryptography * plain text vs cipher text * common ciphers:   + substitution:     - rotation cipher     - random substitution     - polyalphabetic cipher (e.g. Vigenère)   + methods for cracking substitution ciphers:     - brute force     - frequency analysis | *Cryptography*   * use common ciphers |
| 5–8 | **Data management**  *Database management system (DBMS)*   * relationship between data and information * flat file vs relational database * relational database managements system (RDBMS):   + role of a RDBMS in handling access to data   + independence of data from RDBMS   *Core database concepts*   * organisation of a relational database:   + entities   + attributes   + relationships:     - one to one     - one to many     - many to many   + tables as the implementation of entities, consisting of fields and records   + hierarchical structure of data     - field/attribute     - record     - table/entity   + datatypes     - integer     - float     - Boolean     - text     - date * primary and foreign keys to link tables * composite key * data anomalies:   + insert   + update   + delete   *Data modelling*   * purpose of database documentation for developers:   + data dictionary   + entity relationship (ER) diagrams using crow’s foot notation (see support document)   *Data integrity*   * factors influencing integrity of data, including:   + currency   + authenticity   + relevance   + accuracy   + outliers (cleaning) * relationship between validity and accuracy of data | *Data modelling*   * analyse ER diagrams written in crow’s foot notation (3 to 6 tables) * create accurate ER diagrams (3 to 4 tables) using crow’s foot notation * create a data dictionary (see support document) * resolve many to many (M:N) relationship |
| 9–11 | *Normalisation*   * purpose of normalising data to third normal form (3NF) * know the process to normalise data to 3NF | *Normalisation*   * apply the process to normalise data to 3NF (3-4 tables)   + normalise data to 1NF   + normalise data to 2NF   + normalise data to 3NF |
| 12–13 |  | *Database creation and manipulation*   * use a RDBMS to create and manipulate a relational database with a minimum of 3 tables. * use SQL to manipulate a database including:   + SELECT   + INSERT   + DELETE   + UPDATE   + ORDER BY   + inner join across two tables   + aggregate functions (COUNT, SUM, AVG, MAX, MIN) |
| 14 | *Development issues*   * Ethical issues   + collecting data about individuals   + privacy concerns   + appropriate use of data   + Australian Privacy Principles applicable to the use of personally identifiable and sensitive data * Security issues   + keeping personal data private   + backups of organisational data   + restricting access to data * Legal issues   + implications of the *Privacy Act 1988* for developers |  |
| 15 | Revision | |
| 16 | Semester 2 examination | |