

Computer Science Scope and sequence

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Computer Science: Scope and sequence of content

Course		pp. 10–11	p. 12–13	pp. 14–15	p. 16–17	p. 18–19	pp. 20–21
Content organiser		UNIT 1A Personal use of computer systems	UNIT 1B Use of personal communication and information systems	UNIT 2A Developing system solutions	UNIT 2B Developing database and communication systems solutions	UNIT 3A Design and development of software solutions	UNIT 3B Design and development of database applications and communication systems
Components	Hardware Components	<ul style="list-style-type: none"> • identification of components to address processing (Central Processing Unit, input devices, output devices, primary memory, secondary memory/storage) • identification of components to address communication functions (buses, expansion slots) • storage types <ul style="list-style-type: none"> ▪ magnetic (disk and tape) ▪ optical (CD and DVD) ▪ chip (USB flash drive) • memory types (RAM, ROM, flash) • peripheral devices (mouse, keyboard, scanner, printer, digital camera, microphone, speaker) • ports (USB, firewire, PS2, Ethernet, serial) • basic care and handling of hardware equipment including personal safety and proper use of components. 	<ul style="list-style-type: none"> • peer-to-peer networking • identification of components to address communication process functions (modem, network interface card, switch, router, access point) • key concepts, terminology and functions of common network components <ul style="list-style-type: none"> ▪ data transmission rates (Mbps, Gbps) ▪ wired data transmission media (twisted pair and optical fibre) ▪ wireless transmission. 	<ul style="list-style-type: none"> • identification of components in industry systems to address processing, input, output, memory/storage and communication functions: <ul style="list-style-type: none"> ▪ central processing unit description and purpose (registers, arithmetic logic unit, control unit, program counter, clock) ▪ input devices (mouse, keyboard, tablet, touch screen, bar code scanner, RFID reader, microphone, video capture) ▪ output devices (monitor, printer, plotter, speaker) ▪ primary storage (RAM, ROM, cache) ▪ secondary storage types (magnetic, optical, flash, DAT) ▪ buses (data, address, control). • standards in hardware components <ul style="list-style-type: none"> ▪ storage capacities (bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte) ▪ processor and bus speeds (megahertz, gigahertz) ▪ graphics displays (resolution) ▪ components from different manufacturers working together. • evolution of business hardware • comparing performance using benchmarking. 	<ul style="list-style-type: none"> • identification of components to address communication process functions (sending devices, communications devices, channels or pathways, receiving devices, messages, protocols) • key concepts, terminology, functions, capabilities and limitations of common components in communication systems: <ul style="list-style-type: none"> ▪ types of networks (PAN, LAN, WAN) ▪ factors affecting the design of networks ▪ digital and analogue transmissions ▪ network devices (network interface card, switch, router, modem, access point) ▪ protocols (TCP/IP, WAP, Ethernet, FTP, HTTP, SMTP) ▪ transmission rates (bps, Kbps, Mbps, Gbps) and the need for bandwidth ▪ transmission media: <ul style="list-style-type: none"> ○ copper (coaxial, twisted pair) ○ optical fibre (single-mode, multi-mode) ○ wireless (infrared, cellular, radio, microwave, satellite) ▪ purpose of subnets ▪ network standards (Ethernet standards 802.3 and 802.11, Bluetooth, IrDA, RFID) • network topologies for LANs (star, ring, bus) • client/server and peer-to-peer • security of information over the internet (firewalls, authentication and encryption). 	<ul style="list-style-type: none"> • computer architecture <ul style="list-style-type: none"> ▪ role of the central processing unit (arithmetic logic unit, control unit, registers, program counter, cache), system clock and data bus in the fetch-execute cycle ▪ multi-core processor architectures e.g. dual-core, quad-core ▪ multi-processor and parallel system architecture • fault diagnosis e.g. selective component removal/replacement • hardware preventative maintenance e.g. inspection, cleaning and repair • backup recovery systems (RAID, backup, snapshot imaging) • virtualization. 	<ul style="list-style-type: none"> • computer architecture required for communications <ul style="list-style-type: none"> ▪ network devices (router, switch, firewall, modem, network interface card, wireless access point) ▪ network media (twisted pair, coaxial, fibre optic, wireless) ▪ network control protocols (CSMA/CD, CSMA/CA) ▪ digital and analogue data transmission ▪ error detection/correction in digital data transmission. • network topologies and protocols for LANs <ul style="list-style-type: none"> ▪ network types (PAN, HAN, LAN, MAN, WAN, GAN) ▪ intranet, extranet and the internet ▪ network topologies (star, bus, ring, point-to-point, hybrid) ▪ communications protocols and standards <ul style="list-style-type: none"> ○ wireless (Ethernet 802.11x, WAP, Bluetooth) ○ wired (Ethernet 802.3, token ring 802.5) ○ TCP/IP and DNS • client server technology • LAN and WAN structures (subnets) • storage area networks (fibre channel, iSCSI).

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	Software Components	<ul style="list-style-type: none"> • common application software (word processing, spreadsheet, database, graphics manipulation, desktop publishing, animation, CAD) • internet software, (browser, plug-in, email, FTP) • operating systems and use of common peripheral devices • basic maintenance and protection software (defragmentation, error checking, disk cleanup, backup, anti-malware). 	<ul style="list-style-type: none"> • application software (browser, email, web authoring, scripting) • internet connection and use of common peripheral devices • maintenance procedures to rectify simple difficulties • directory structures (folders, files) • file types for web use (htm, html, pdf, jpg, gif, png, mp3, wav, swf, wmv). 	<ul style="list-style-type: none"> • business application software (accounting, database, presentation, project management, spreadsheet, word processing) • graphics and multimedia software (CAD, desktop publishing, image editing, multimedia authoring, video and audio editing, web page authoring) • generations of programming languages (machine, assembler, high level) • operating systems (Linux, Unix, Windows, MacOS) • utility software (disk defragmenter, anti-malware, compression, encryption), virus checking software • backup and restore. 	<ul style="list-style-type: none"> • database systems (flat file, relational) • features and functions of web interfaces to databases • features of network operating systems (administration, resource management, security). 	<ul style="list-style-type: none"> • purpose of operating systems • distinguish between batch systems and real-time systems • identify functions of operating systems (scheduling, managing concurrency, managing memory, managing devices, file systems) • different programming languages (procedural, non-procedural, object-oriented, event-driven, platform-independent, visual, scripting). 	<ul style="list-style-type: none"> • types of databases (distributed, centralised) • data warehouses, data marts and data mining • protocols and security issues in network devices • encryption methods e.g. private key encryption, public key encryption, PGP • connection of databases to the internet e.g. querying a web database through use of ODBC, using SQL, PHP, VB.net. * <i>refer to Specifications booklet</i>

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Design, development and management	Systems	<ul style="list-style-type: none"> hardware and software systems used in personal computing (applications, operating systems) interrelationship between users, hardware and software input, processing and output for personal computers installation of simple software and peripheral devices basic maintenance procedures to rectify simple difficulties introduction to planning, producing and evaluating a simple software system. 	<ul style="list-style-type: none"> techniques for developing simple personal databases and communication systems modification of an existing information system creation and administration of a simple network e.g. peer-to-peer, bluetooth configuration of a networked personal computer for peripherals (printer, scanner) and internet connection. 	<ul style="list-style-type: none"> different types of business systems (transaction processing, groupware, expert systems, decision-support systems) benefits and economic considerations for implementation of industry type systems methods for developing systems including the Systems Development Life Cycle and prototyping. <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> database system components (tables, queries, forms, reports) web-based business systems (intranet, extranet, internet, content management system) database system documentation (data dictionary) TCP/IP model. <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> project management tasks (scheduling, budgeting, tracking) project management tools (Gantt charts, milestone charts, PERT/CPM charts) use of Systems Development Life Cycle <i>*refer to Specifications booklet</i> variations of SDLC (top-down, bottom-up, prototyping and rapid application development). 	<ul style="list-style-type: none"> function and use of database management systems (data definition, data integrity, data manipulation, data security) network interconnectivity (OSI model, TCP/IP model) <i>*refer to Specifications booklet</i> database interconnectivity (ODBC) convergence of technologies e.g. VoIP and using the Internet for voice telephony, web casting of radio and TV programs development and management of database systems using data normalisation, data dictionary definitions, entity relationship diagram, data flow diagram as data models for <ul style="list-style-type: none"> multiple table structure to store data visual interface to assist user access queries, forms, reports to display and extract data for users.
	Ethics, law and society	<ul style="list-style-type: none"> ethical and legal issues in the personal use and storage of data measures an individual can take to help maintain data privacy and security e.g. personal firewall how user and developer needs and wants influence the choice, use and creation of personal computer systems ergonomics associated with computer use. 	<ul style="list-style-type: none"> reliability of internet data for personal use role of users and developers in maintaining the security of information transmitted through communication systems legal requirements and implications of information kept by various bodies about individuals. 	<ul style="list-style-type: none"> user and developer concerns about inclusivity and empowerment monitoring employee use of computer-based systems (email and internet use) licensing requirements for software e.g. single-use, multi-use, network and restricted and unrestricted site cost benefit of open source, shareware, commercial software. 	<ul style="list-style-type: none"> legal requirements for the collection, storage and use of information rights and responsibilities of users, developers and businesses data security and privacy demographics of computer use in Australia. 	<ul style="list-style-type: none"> interface evaluation and inclusivity professional ethics and personal skills of developers and users present and future impacts of computer-based systems on society. 	<ul style="list-style-type: none"> security implications, encryption and secure websites user and developer codes of conduct when using/handling data in databases and networks privacy and legal implications of personal data influence of changing technologies on employment, entertainment and information global reliance on computer systems and the connectivity the internet provides.

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Tools	Data representation and organisation	<ul style="list-style-type: none"> the concept of a data type program components e.g. inputs, processing, outputs. <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> data types used with database applications e.g. number (integer, real, autonumber), text/string, Boolean (yes/no), date, currency flow of data in an information system components of a single table database (field, record, file) awareness of internet protocols (HTTP, TCP/IP, SMTP, POP3 and FTP). 	<ul style="list-style-type: none"> program components and constructs (variables, constants, data types, statements, sequence, selection and repetition) <i>*refer to Specifications booklet</i> number systems (decimal, binary, hexadecimal) <i>*refer to Specifications booklet</i> encoding (ASCII, Unicode). <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> Database Management Systems to manipulate multiple tables normalisation concepts (normalisation, relation, primary and foreign key, efficiency of stored data, update anomaly, data integrity, redundancy) <i>*refer to Specifications booklet</i> use of 1:M relationship to represent linked tables comparison of sequential and indexed file processing. 	<ul style="list-style-type: none"> programming constructs (constants, variables, statements, control structures, modularisation) <i>*refer to Specifications booklet</i> fundamentals of data structures (one-dimensional arrays, records and files) <i>*refer to Specifications booklet</i> data storage and access (content management systems and portals). <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> normalisation to third normal form <i>*refer to Specifications booklet</i> resolving many to many M:N relationships to develop a multi-table relational database system <i>*refer to Specifications booklet</i> physical storage of data (online, distributed, local databases) <i>*refer to Specifications booklet</i>
	Systems development tools	<ul style="list-style-type: none"> configuration of a home computer for peripherals and internet connection e.g. use of wizards simple programming language e.g. macros, visual programming language <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> single table database application to create tables, filters, sorts, simple queries, forms and reports <i>*refer to Specifications booklet</i> comparison of web-based construction tools use of simple web tools to create simple linked web pages use of content management system tools to upload web pages to a web server. 	<ul style="list-style-type: none"> use of simple algorithms and a programming language to develop computer-based systems for industry <i>*refer to Specifications booklet</i> trace tables for desk checking, testing and debugging <i>*refer to Specifications booklet</i> Data Flow Diagrams (context diagram, level 0 DFD with 3 to 5 processes). <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> use of diagrams to represent network devices and network design introduction to Entity Relationship Diagrams (ERDs) <i>*refer to Specifications booklet</i> relational database application to create 2 to 3 linked tables, queries, forms and reports. 	<ul style="list-style-type: none"> structured programming using modularisation and parameter passing including stubs, subs, functions, scope of identifiers, structure charts <i>*refer to Specifications booklet</i> algorithmic and programming techniques including documentation, testing and debugging logic, syntax and run-time errors <i>*refer to Specifications booklet</i> levelled Data Flow Diagrams (context diagram, level 0 DFD, level 1 DFD). <i>*refer to Specifications booklet</i> 	<ul style="list-style-type: none"> LAN and WAN network diagrams <i>*refer to Specifications booklet</i> database modelling tools including Entity Relationship Diagrams and normalisation <i>*refer to Specifications booklet</i> use of relational database application to create multiple linked tables, queries, forms and reports. <i>*refer to Specifications booklet</i>